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MY SPINE

SOUTH AFRICAN TRIAL EDITION

Lumbar

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Vesuvius Books

My Spine – Lumbar

My Spine – Lumbar

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FOREWORD

Patient expectations about treatment outcomes have been shown to have a significant influence on the results and success of treatment. Current perceptions are often subtly instilled by the non-scientific media and Hollywood-like sources, and the lay public often have unrealistic expectations of the process and likely benefits of treatment. Thus unrealistically high or incorrect expectations can result in dissatisfaction, where the result would have been regarded as good or acceptable, had the correct perspectives been in place. This monograph strives to give spinal patients some of the required insights to maximise appropriate decision making regarding treatment options, and improve understanding of what constitutes a realistic outcome.

My Spine – Lumbar is a multi-authored volume, intended for patients with spinal complaints, and reflects a wide range of experience within the growing field of spinal management and surgery.

The information is set out in a logical progression, giving an understanding of basic spinal anatomy, and following onto symptom explanation, investigations and treatment modalities commonly utilised. A major part of the text is devoted to spinal surgical treatments, explaining the process of going to theatre, some technical information with pictorial illustrations, post-operative management and associated possible treatment complications.

This monograph serves as a useful adjunct in the management of spinal conditions, and could be used in conjunction with the standard discussion between the doctor and patient. It would still be the duty of the doctor to be the prime source of information, and to individualise the extent of the information dependent on the patient's needs and particular circumstances. However, with the doctor's increasing social demands, leading to the further evolution and refinement of the doctor's responsibilities, the duty of the patient to inform him- or herself has been sadly neglected. This monograph would thus also go some way to initiate awareness in patients to take responsibility and be actively involved in the treatment decisions and hence outcomes.

Dr. Gian Marus
President South African Spine Society
2009

NAME

PLEASE READ THE MARKED CHAPTERS WITH CAREFUL ATTENTION. PLEASE DISCUSS ANY QUESTIONS THAT MIGHT ARISE WITH YOUR SPECIALIST BEFORE SIGNING THE DECLARATION.

- CHAPTER 1** Anatomy of the Spine
- CHAPTER 2** Back Pain
- CHAPTER 3** Osteoporosis
- CHAPTER 4** Lumbar Slipped Disc
- CHAPTER 5** Lumbar Spinal Stenosis
- CHAPTER 6** Spondylolisthesis
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- CHAPTER 25** Everyday Life

Please see the website www.my-spine.com for further information about the prosthesis involved as well as videos, forums and blogs.

I,
have read the chapters marked above. I believe that I understand the pathology and the reason why the following procedure

.....
is being carried out to address my underlying pathology and I understand the risks involved. I have had the opportunity prior to signing this document to ask any further questions I may have had about the procedure and the risks involved.

Signed:

Date:

CHAPTER 1



ANATOMY OF THE SPINE

The spine consists of (bones) vertebrae that encircle and protect the spinal cord. These vertebrae are responsible for allowing the spine to move while protecting the spinal cord. To allow for movement and stability, the vertebrae interlock with one another with a joint on either side, one on the left and one on the right. The vertebrae are also separated from one another by intervertebral discs.

The discs are made of a type of cartilage. The disc is made up of a soft, gel-like centre, called the nucleus pulposus, and this gel is kept in position by a tough outer fibrous layer called the annulus fibrosus. The vertebrae of the spine are further kept in position by an array of ligaments. Muscles attach to the vertebrae and nerves leave the spinal canal, formed by the vertebrae, through small openings called the neural foramina. There are 7 neck (cervical) vertebrae, 12 chest (thoracic) vertebrae, 5 lower back (lumbar) vertebrae and 5 sitting bone (sacral) vertebrae. The sacral vertebrae are fused into a single mass called the sacrum or sitting-bone.

It is unusual for the thoracic (chest) spine to undergo wear and tear changes as it is stabilised by the rib cage that is attached to it. The cervical (neck) spine and the lumbar (lower back) spine, on the other hand, are subject to a lot of movement and this is where most of the wear and tear takes place. The lower part of the neck where it attaches to the rigid thoracic spine, stabilised by the ribs, is under a lot of biomechanical stress. The same is true for the lumbar spine. The bottom end of the lumbar spine is attached to the sitting-bone and the pelvis, which is rigid. The same types of mechanical stresses are found here as well as where it attaches at the top to the thoracic spine.

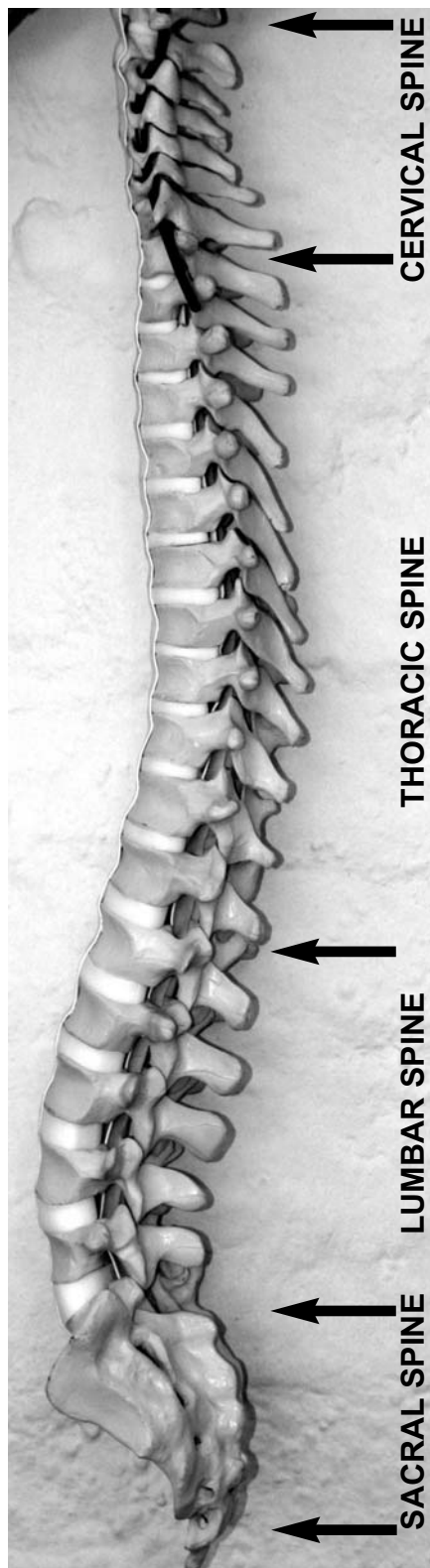


Figure 1.1

This image is a side-on view of the spine.

Note that the spine consists of vertebrae stacked on top of one another. There are 7 cervical vertebrae, 12 thoracic vertebrae, 5 lumbar vertebrae and 5 sacral vertebrae. The sacral vertebrae are fused into a single mass called the sacrum.

There are three mobile curves; one is where the neck (cervical spine) and the chest (thoracic spine) meet. The lower curve is where the thoracic spine and the lower back (lumbar spine) meet. The third curve is a natural bend in the thoracic spine.

There is one last curve, but this curve is fixed and does not move and is the sacral curve and consists of the sacral vertebrae that are fused together.

The three mobile curves are important for the normal biomechanical balance of the spine. The integral stability and movement of the whole body is dependent on the spine, which acts as our central core. The second and equally important function of the spine is to protect the nerves that come from – and travel to – the brain and control all the functions of our body.

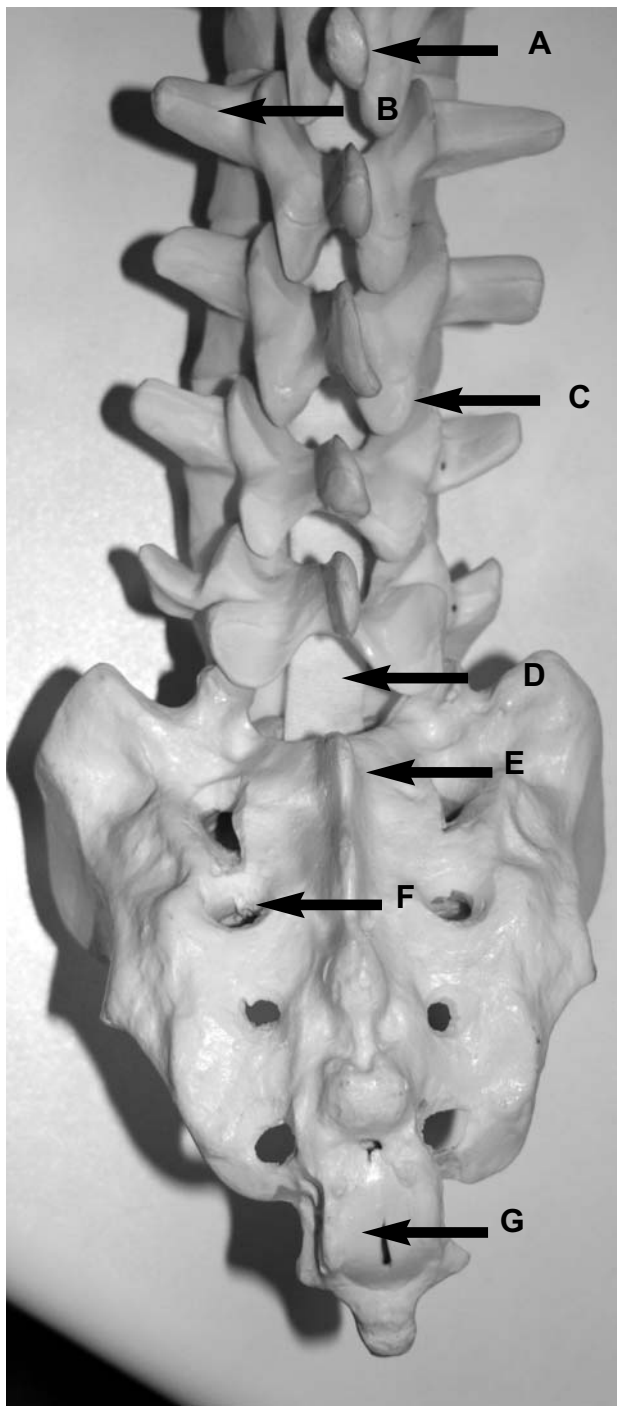


Figure 1.2

This image is a back-to-front view of the lumbar spine.

A: *This is the spinous process of the first lumbar vertebra.*

B: *This is the transverse process of the second lumbar vertebra.*

C: *This is the joint on the right between the third and the fourth lumbar vertebrae.*

D: *This is the spinal canal in which the spinal cord and spinal nerves run.*

E: *This is the spinous process of the first sacral vertebra; it is fused to and continuous with the spinous process of the second and other sacral vertebrae.*

F: *This is the second sacral hiatus. The second sacral nerve leaves the spine from here and extends to the pelvis.*

G: *This part of the spine is called the coccyx and is located at the very bottom of the spine.*

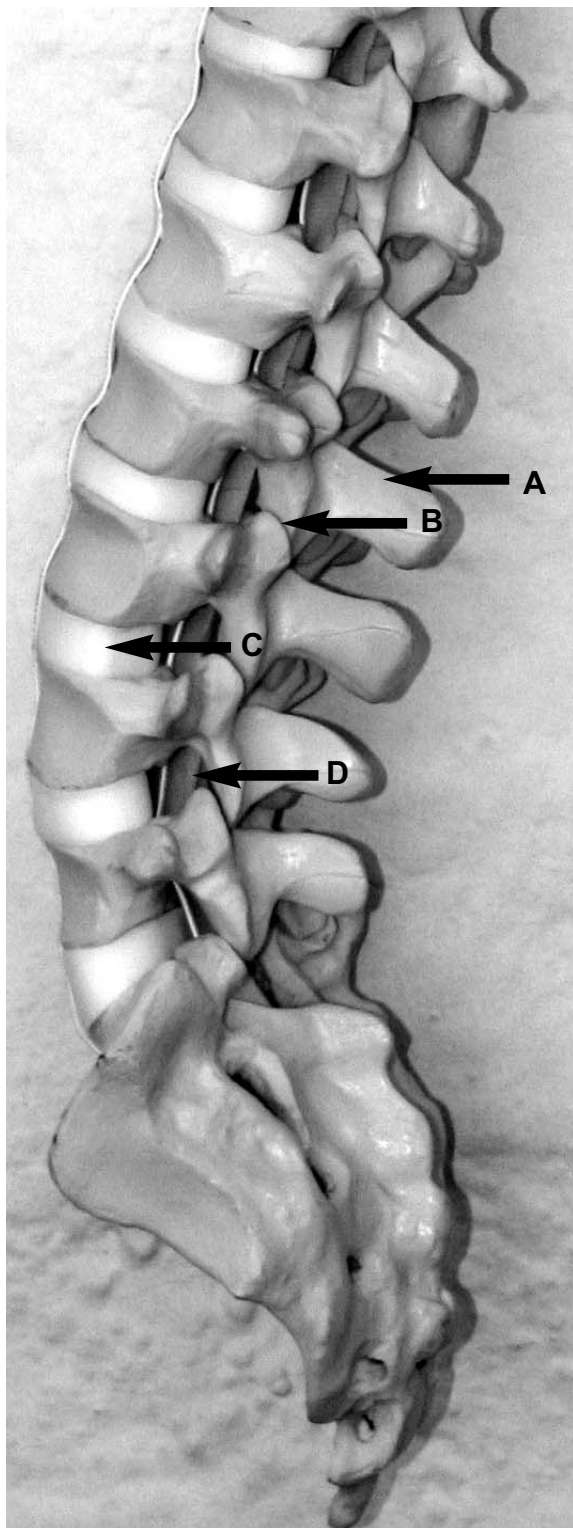


Figure 1.3

This image is a side-on view of the lumbar spine.

A: *This is a spinous process of the lumbar spine. Spinous processes are present on the back of all vertebrae and are palpable through the skin.*

B: *This is the joint between two vertebrae; each vertebra in the spine is joined to the vertebra below and above by these joints on the side. The intervertebral disc separates the vertebrae in the front.*

C: *This is an intervertebral disc. These discs act as shock absorbers and allow for a certain amount of movement between the vertebrae.*

D: *This is a foramen. It is where the nerves that come from the spinal cord exit the spine on their way to the legs. The nerves that run through these foramina control movement in the legs and allow sensation to pass from the legs to the spinal cord and from there to the brain.*

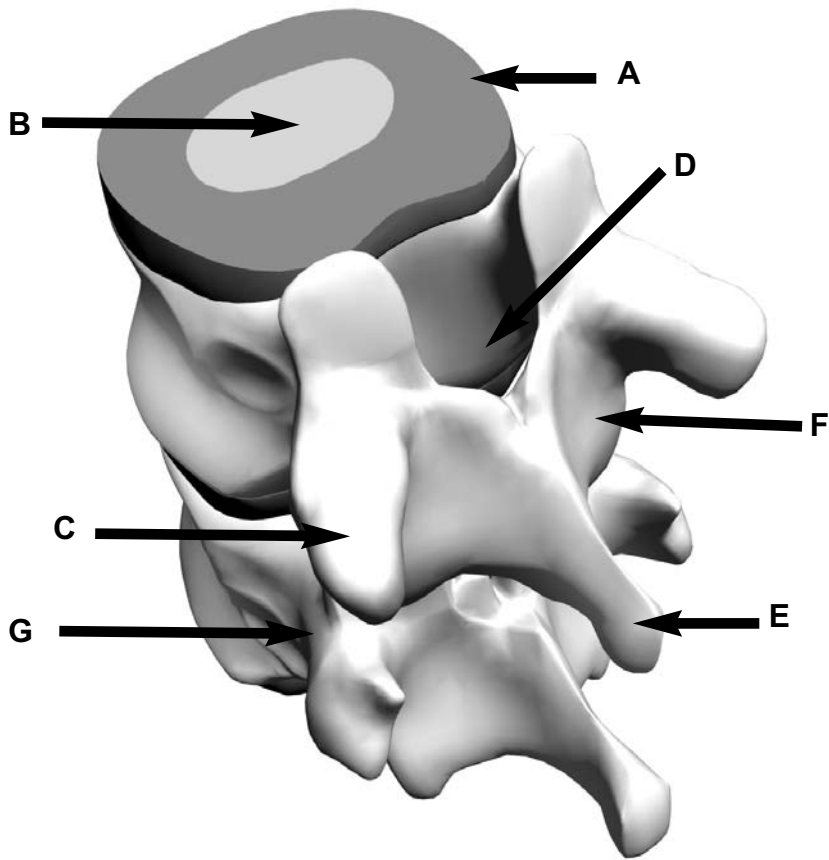


Figure 1.4
This is an illustration of a section of the spine.

***A:** This is the outer, tough part of the intervertebral disc, called the annulus fibrosus. This is the part of the disc that tears when a patient develops a slipped disc.*

***B:** This is the soft, gel-like centre of the disc, called the nucleus pulposus. It is the component that thrusts outward in a slipped disc.*

***C:** This is the transverse process and is the part of the vertebra that sticks out to the side. In the thoracic spine the ribs attach onto these processes.*

***D:** This is the canal formed by the vertebrae in which the spinal cord and nerves run.*

***E:** This is the spinous process of the vertebra.*

***F:** This is the lamina of the vertebra.*

***G:** This is the pedicle of the vertebra.*

CHAPTER 2



BACK PAIN

Back pain is a very common complaint among people of all age groups. It is, however, more commonplace among people in their thirties and onwards. Back pain can be disabling and places a huge burden on the world economy because of work-days that are lost and health care costs.

Back pain is mostly due to degenerative (wear and tear) changes in the spine and is usually part of a progressive disease. Thus, the underlying problem responsible for back pain will slowly but surely worsen over time. It is therefore of paramount importance that treatment is focused on supporting the structures of the back and to prevent excessive stress on the spine.

Back pain can be acute or chronic. Chronic back pain is pain that lasts for more than three months. There are three types of spinal pain: mechanical back pain, referred back pain and sciatica.

Mechanical back pain

This is pain that is caused, as the name suggests, by the mechanics of movement. There are muscles, tendons, vertebrae, discs and joints between the vertebrae, nerves and other structures that can cause pain. Mechanical pain is based on inflammation of these structures and the aggravation of this inflammation by movement.

The main source of mechanical back pain, however, is the joints between the vertebrae called the facet joints. This pain is typically increased by certain movements. Turning over in bed and getting out of bed in the morning can be difficult.

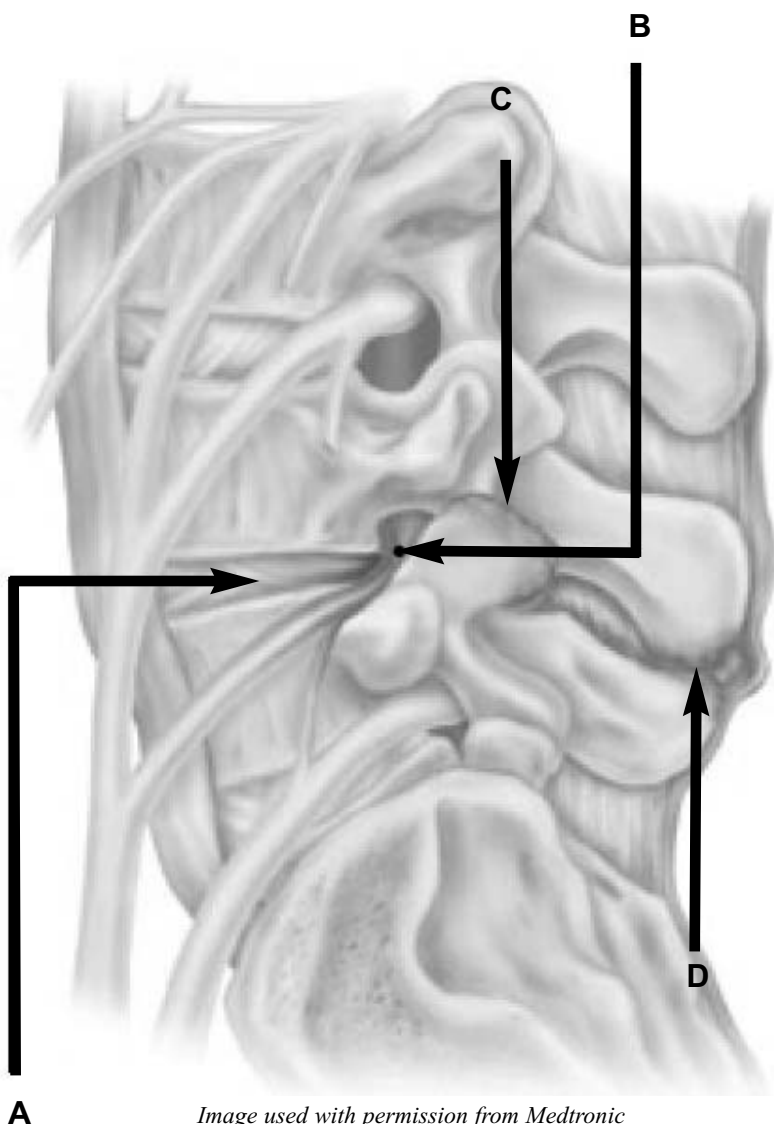


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Figure 2.1

This is an illustration of a collapsed, inflamed disc (A) that is compressing a nerve root (B) leaving the spinal canal. As this disc collapses, it does not support the weight of the spine the way it should and the weight is transferred to the facet joint (C), which becomes inflamed and arthritic. The distance between the spinous processes (D) is also reduced, causing them to rub against each other.

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The pain usually improves with movement, but certain movements, like arching your back, typically makes it worse. It is frequently associated with referred pain, in other words pain that is experienced at a site distant to the source of the inflammation.

Referred back pain

This is pain that spreads from the inflamed tissue in the lower back along nerves to other parts of the body. This would frequently be experienced in the area of the hips, the thighs and even between the shoulder blades. This is directly associated with mechanical back pain. It should not be confused with sciatica. The patterns of referred pain frequently overlap somewhat with sciatica, which can be confusing in making the diagnosis of the type of pain.

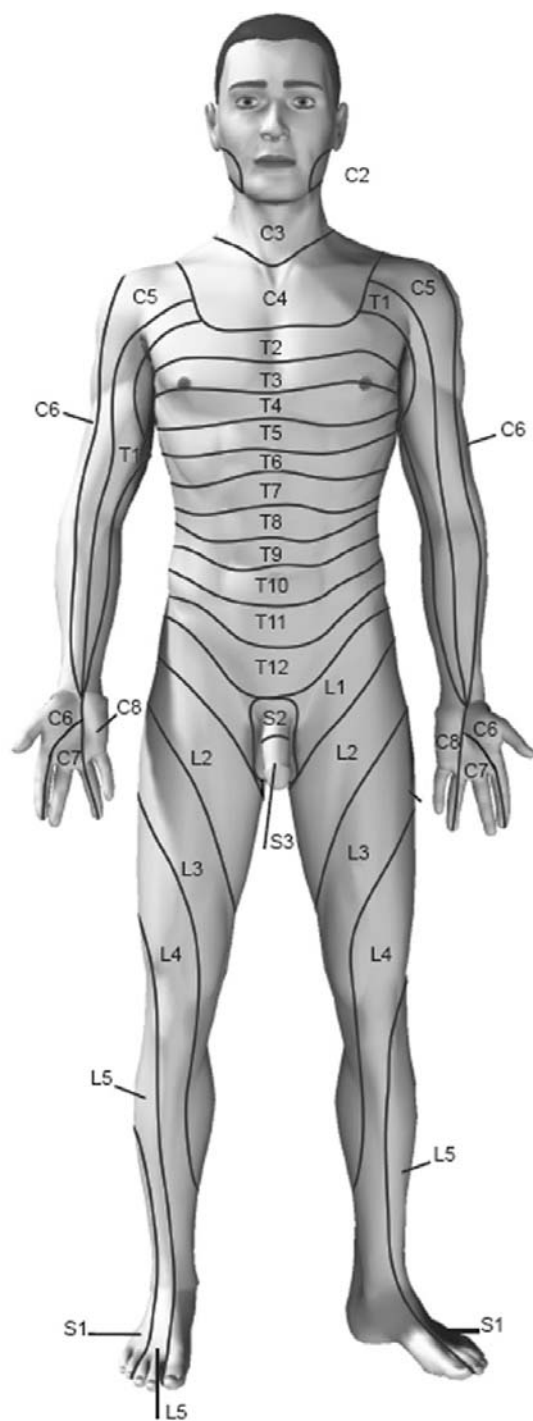
Sciatica (Radicular pain)

This is pain that is caused by a pinched nerve and the pain will travel down the length of the nerve and be most severe at the distal point of the nerve, but can manifest at any point along the length of the nerve. When the nerve, for instance between the fourth vertebra and the fifth vertebra, is being pinched, the pain will be sensed at the ankle and on the top of the foot, as this is where the nerve ends up. It is typical that referred pain spreads to the upper leg, but sciatica would normally spread beyond the knee. Apart from the compression of the nerve root, there is usually also inflammatory changes in the nerve root that leads to pain.

A pinched nerve may require surgery. Although surgery is very effective in loosening nerves that are being pinched and fixing unstable areas of the spine, it almost always leads to increased stress on the rest of the spine and is believed to speed up the wear and tear of the spine.

The main aim of treating spinal pain should always be to support the normal biological recovery processes of the body. Surgery is always the last option and the aim of surgery would be to relieve the symptoms and to maintain the normal biomechanical stability of the spine.

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My Spine - Lumbar

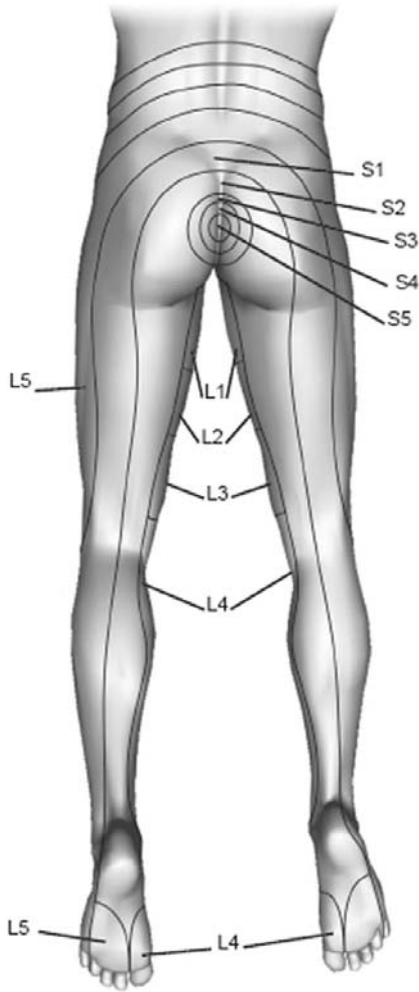


Figure 2.2

These two illustrations demonstrate the dermatomes of the body. A dermatome is the area of the skin that is being supplied with sensation by a specific spinal nerve.

Your specialist will use this map to get an idea of which nerve is being compressed in nerve root mediated pain (radiculopathy). Note for instance that compression of the fourth lumbar nerve (L4) will cause pain over the shin and compression of the fifth nerve root (L5) will cause pain over the outer part of the shin and on top of the foot.

The whole body is divided into dermatomes and the dermatome map is an invaluable aid for your specialist. These areas are, however, not completely fixed and there is some overlap and certainly differences between the exact location of dermatomes from patient to patient.

It is important to confirm the nature of nerve compression with an MRI scan or CT myelogram (see the chapter Tests and Scans). Radicular or nerve root pain is felt in a specific dermatome and should not be confused with referred pain, which is pain that spreads from inflamed tissue such as the disc and the facet joints to non-specific areas on the skin. These referred pains are frequently said to be non-dermatomal, indicating that, as they do not comply with dermatomal patterns, they are unlikely to be nerve root-related pain.

CHAPTER 3



OSTEOPOROSIS

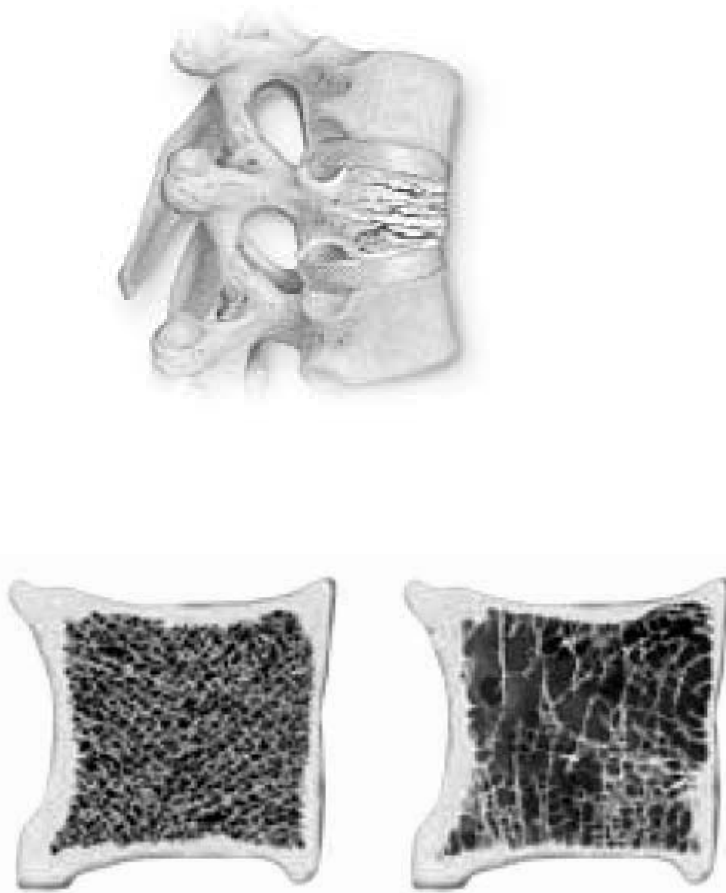
What is it?

The hallmark of this disease is brittle bones. The weak bones are due to a decreased absorption of calcium into the body and depletion of calcium and bone protein. It is a common type of metabolic bone disease in which bones become thinner and weaker as a part of ageing. The bones are subject to fractures and heal slowly, occurring especially in women following menopause. If it is left untreated, the skeletal bones will become fragile and some of them will be likely to break or fracture, especially the hip and spinal bones.

Osteoporosis is most common in women over the age of 50 years. Following menopause, women experience rapid bone loss due to the decrease in oestrogen production. Any bone can be affected, but of special concern are fractures of the hip and spine. Spinal or vertebral fractures can lead to a loss of height, severe back pain, nerve compression and deformity.

The following risk factors are associated with osteoporosis: smoking, chronic diseases, alcohol consumption, high caffeine consumption, early hysterectomy with associated removal of ovaries, hyperthyroidism and chronic steroid medication usage. Vitamin D plays a crucial role in calcium absorption. Building strong bones by eating calcium-rich foods, maintaining a well-balanced diet and exercising during early life can be the best defence against osteoporosis.

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Figure 3.1

These images demonstrate osteoporosis. The top image shows a fracture of the thoracic spine. This type of fracture is called a compression fracture. Note the wedge shape of the vertebra as it collapsed at the front. The bottom image demonstrates a normal vertebra on the left and an osteoporotic vertebra on the right. Note the loss of bone in the body of the vertebra with just a few slivers of bone remaining.

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What are the symptoms?

Bone loss occurs without symptoms. People can lose bone mass over a long period of time without being aware of it. The first indication of osteoporosis is frequently a fracture of the spine, hip or wrist following a simple fall. When bone loss is severe and osteoporosis is advanced, the following symptoms can occur:

- Pain in the lower back
- Neck pain
- Leg cramps at night
- General bone pain and tenderness
- Abdominal pain
- Rib pain
- Broken vertebrae
- Brittle fingernails

Loss of height of the vertebrae and a stooped posture are the main effects of osteoporotic spinal fractures.

How is it diagnosed?

Osteoporosis is diagnosed with spinal X-rays, a spinal CT scan or a bone density scan (Dexa scan). A suspicion of osteoporosis is usually present when a spinal fracture occurs where there has been only a small amount of force present, such as a simple fall.

How is it treated?

The best treatment is prevention. Adequate calcium and vitamin D intake and exercise are important preventative aids against osteoporosis. Avoiding smoking and excessive alcohol intake are other important factors. There are a number of drugs that may help to increase bone density. The antiresorptive medications, biphosphonates (alendronate, ibandronate and risedronate), calcitonin, oestrogens and raloxifene affect the bone remodeling cycle.

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Teriparatide, a form of parathyroid hormone, is a newly approved medication for osteoporosis. It is the first drug to increase the rate of bone formation in the bone remodeling cycle.

Fractures that are sustained because of osteoporosis can be treated with Kyphoplasty, Vertebroplasty, bed rest or external bracing. Kyphoplasty is a procedure where a balloon is inserted into the vertebra to raise the collapsed segment and bone cement is then injected into the space created by the balloon. In a Vertebroplasty, bone cement is injected into the vertebra without a balloon being inflated. These procedures are performed with needles that are inserted through the skin of the back (see the chapter *Kyphoplasty and Vertebroplasty*). External bracing requires that a patient wears a brace.

Does this treatment have any complications?

There is a small risk with Vertebroplasty and Kyphoplasty that the bone cement may leak out into the blood vessels or into the spaces where the nerves are located. This is rare and is avoided by careful surgical techniques. Speak to your specialist about the other risks involved (see the chapter *Your Back Operation*).

What are the long-term expectations?

Osteoporosis is a progressive disease that can lead to ongoing fractures that can be disabling. Prevention is the best advice, but there is hope with newer treatments that are available. It is crucial to diagnose osteoporosis as early as possible.

CHAPTER 4



LUMBAR SLIPPED DISC (ALSO CALLED HERNIATED OR PROLAPSED DISC)

What is it?

The spine consists of a series of vertebrae that are stacked on top of one another from the neck to the pelvis. These vertebrae are connected and kept in the correct position by the discs that are between the vertebrae and also the facet joints that are located on the side of the vertebral bodies, which interlock with one another. There are also supporting ligaments and tendons. The discs between the two adjacent vertebrae are composed of a central, soft, jelly-like substance, called the nucleus pulposus, and an outer, tougher fibrous part, called the annulus fibrosus. In some cases the tough annulus fibrosus becomes damaged and tears, leaving a defect in the strong outer layer. A bit of the nucleus pulposus can then push through this tear and end up in the spinal canal and press against the nerves in the spinal canal (see figure 4.1). This can be caused by a traumatic injury, but is usually due to an inborn predisposition towards weak discs.

The spinal cord extends from the brainstem to the lower spine and ends just below the level of the thoracic and lumbar spine junction. A slipped lumbar disc simply compresses nerve roots that are dangling in the spinal canal. This is because there is no spinal cord at this level, but only nerve roots that originate from the spinal cord.

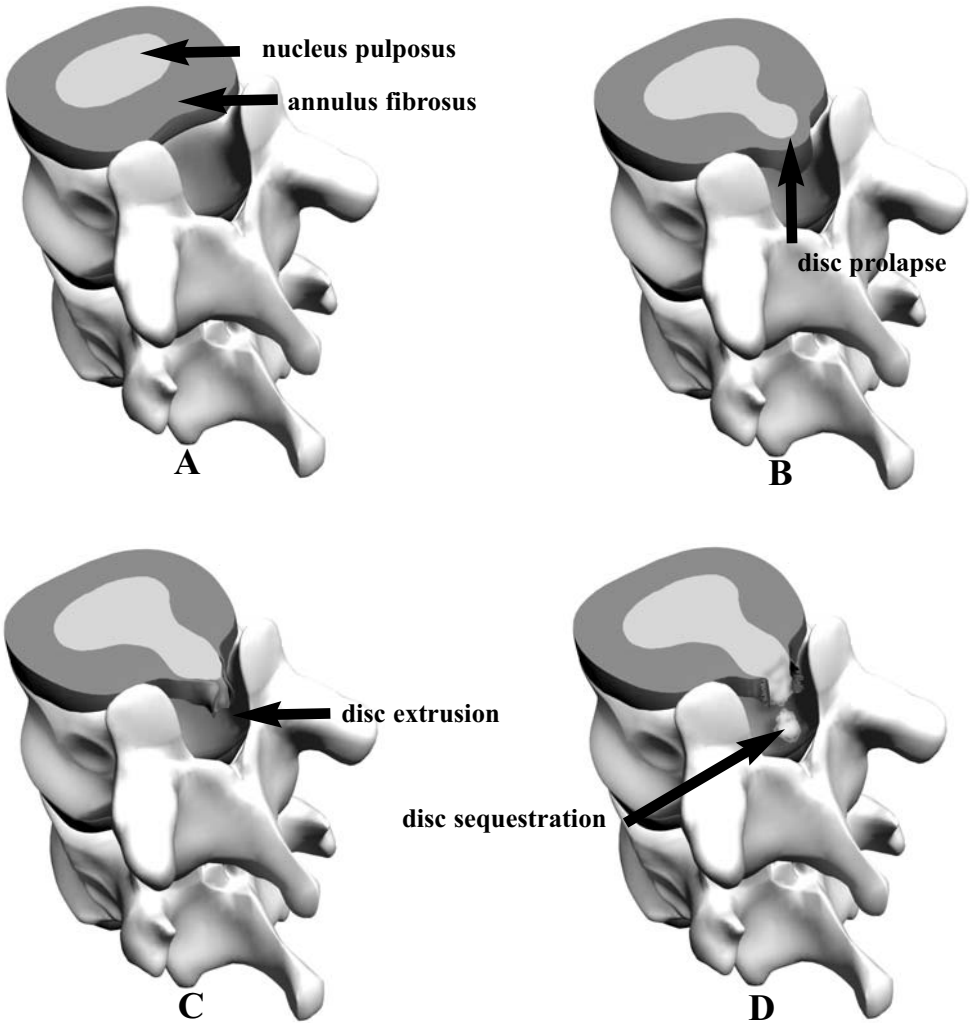


Figure 4.1 The four stages of disc damage, leading to herniation (prolapse) of disc material.

A: Annular tear. At this stage the disc is intact and there is only a small tear in the tough outer layer (annulus fibrosus).

B: Disc prolapse. The soft centre of the disc (nucleus pulposus) is now starting to protrude from its normal position, but is still contained within the outer layer.

C: Disc extrusion. At this point the soft nucleus has broken through the annulus fibrosus.

D: Disc sequestration. At this point the nucleus has broken through the annulus fibrosus and a piece of the nucleus has broken off from the rest and is lying loose in the spinal canal.

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A herniated cervical or thoracic disc, on the other hand, can compress the cord or the nerve roots as they leave the spinal cord.

What are the symptoms?

When the part of the nucleus that herniated compresses the nerves in the spinal canal, you may experience back pain and pain in one or both legs. Some people experience pins and needles in the legs and feet. Pain and discomfort may also be sensed in the hip, between the shoulder blades and in the groin. Later on, symptoms such as weakness and unsteadiness of the legs and feet, may be experienced. In Cauda Equina syndrome the nerves to the bladder and bowel are affected, leading to dysfunction of control of the bowel and bladder.

How is it diagnosed?

A clinical examination by your specialist or therapist will allow for a reasonable suspicion, but the only definite way is by doing a magnetic resonance imaging (MRI) scan (see the chapter *Tests and Scans*). Sometimes, because of technical factors, a CT scan is performed (see the chapter *Tests and Scans*). This is usually when an MRI scan cannot be performed due to the unavailability of an MRI scanner, when there are contra-indications to doing a scan or when technical factors such as the presence of certain metal fusion apparatus in the spine make an MRI scan unreliable.

See the chapter *Tests and Scans* for the terminology that you will find on your MRI scan report and what it means in plain English. Other tests that might be used are discograms and nerve blocks. Sometimes electromyograms (EMGs) are also used (see the chapter *Tests and Scans*).

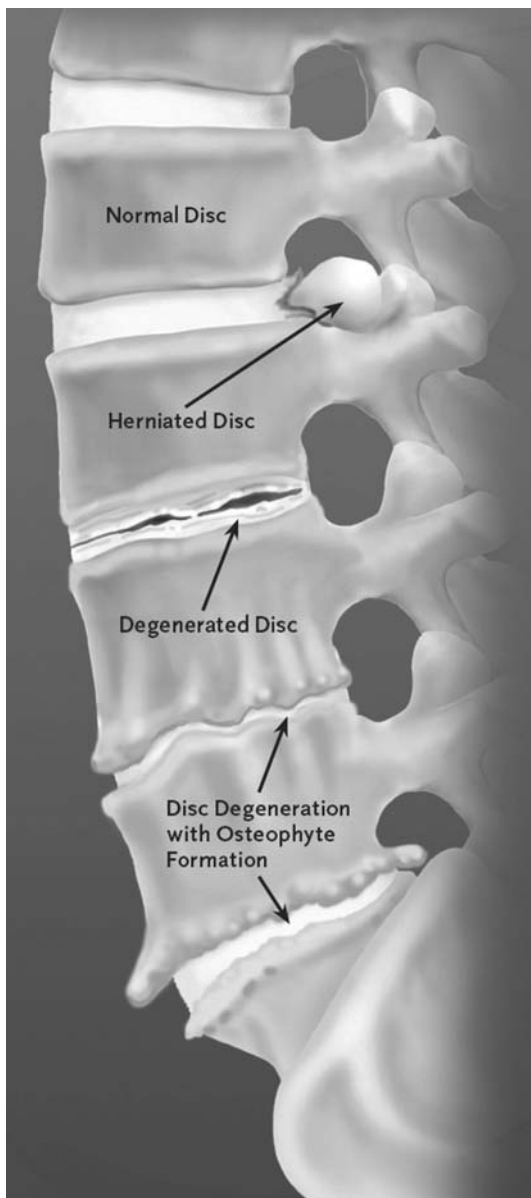


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Figure 4.2

This drawing illustrates different phases of disc disease. Discs may degenerate with or without accompanying bony outgrowths (osteophytes). Sometimes the disc degeneration will lead to a disc prolapse (disc herniation). See Figure 4.1 for the different stages of disc herniation.

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How is it treated?

There are always four options:

No treatment – This is acceptable if there is no serious nerve compression, in other words, there is no spasticity or muscle weakness. There are always people who choose this option for a variety of personal reasons. There is a certain proportion of patients whose symptoms will get better with time without an operation.

Non-invasive treatment – The initial treatment for a lumbar disc herniation is conservative treatment, which might include anti-inflammatory medication, analgesic medication, physiotherapy and other manual treatments such as chiropractic treatment, pressure point therapy, massage therapy and traction. This would usually be followed for a period of at least six weeks.

Semi-invasive treatment – This includes procedures such as radiofrequency rhizotomy, caudal or sacral block, epidural block and Nucleoplasty. These treatments may be highly effective, have very few side-effects or complications and are performed as day procedures. These procedures have a very definite place in the non-surgical management of lumbar disc disease.

If conservative management is unsuccessful, surgery is usually indicated. In situations where there is muscle loss or sensation loss due to a compressed nerve, surgery is considered much earlier. Compression that continues for too long can cause permanent nerve damage. The longer the duration of the symptoms, the less the chance of success when operating to decompress the nerves.

Invasive (surgery) – The indications for surgery are:

1. Failed conservative management. This would include the use of analgesic medication, anti-inflammatory medication, physiotherapy and chiropractic treatment for a period of at least six weeks before surgery is contemplated.

My Spine - Lumbar

2. Pain that does not respond to any other treatment modality and is sufficiently severe to limit your daily activities and quality of life. This includes local lower back pain, referred pain and radicular pain.
3. Muscle weakness due to nerve compression (radicular weakness).
4. Spasticity of the legs.
5. Cauda Equina syndrome or Conus Medullaris syndrome. These are serious conditions that are characterised by weakness, sensory loss and bowel and bladder dysfunction. These are emergencies that require immediate surgery.

There is a whole spectrum of operations that might be suitable for treating a prolapsed (herniated) disc. Please see the relevant chapter regarding the procedure that your specialist is suggesting.

Does this treatment have any complications?

The most common complications of surgery are infection and wound haematoma (bleeding under the skin). The most feared complication is nerve damage, but this is extremely rare, although not unknown. The outer layer of the nerves (the dura) can also be torn and this will lead to a leakage of spinal fluid (cerebrospinal fluid). This needs to be repaired. Speak to your specialist about a more comprehensive list of possible complications (see the chapter *Your Back Operation*).

What are the long-term expectations?

Lumbar degeneration and lumbar disc disease are progressive entities. In cases where the disease is conservatively managed, it is possible that the herniated portion may retract and no longer cause symptoms or require surgery. When only a portion of the slipped (herniated) disc is surgically removed, there is a possibility that another piece of the remaining disc may herniate and compress a nerve root, requiring further surgery. When the disc is completely removed and a fusion is formed, this may accelerate the degeneration process in the adjacent discs. It is obvious that disc degeneration is a progressive entity that may well require further treatment in the future, no matter what treatment is instituted.

CHAPTER 5



LUMBAR SPINAL STENOSIS

What is it?

This condition is characterised by a narrowing of the spinal canal that carries the nerve roots. This leads to compression and ultimately dysfunction of these nerve roots. The process usually starts off in the disc with a decrease in the height of the disc as well as the weight-carrying ability of the disc. The collapse of the disc leads to compression of the nerve roots. The compressive elements are a combination of a thickening of the normal ligament of the spine, the ligamentum flavum, and the enlargement of the facet joints (see the chapter *Anatomy of the Spine*). The facet joints enlarge in response to their greater weight-carrying responsibility as the disc becomes damaged. There is usually a degree of slippage of the vertebrae on top of one another and the spine can be bent from side to side (scoliosis) or have an abnormal angle of bending forwards (kyphosis) or backwards (lordosis). This is part of the normal ageing process and is called acquired spinal stenosis. Another term is spondylosis or spinal osteoarthritis.

Another type is that of an inborn abnormality, which predisposes people to this condition. People who are born with congenital spinal stenosis have a very small spinal canal. This is because the pedicles (see the chapter *Anatomy of the Spine*) are shorter than normal and do not allow for sufficient space in the spinal canal. Spinal stenosis leads to a syndrome of nerve compression that is usually a slow and progressive disease.

My Spine - Lumbar

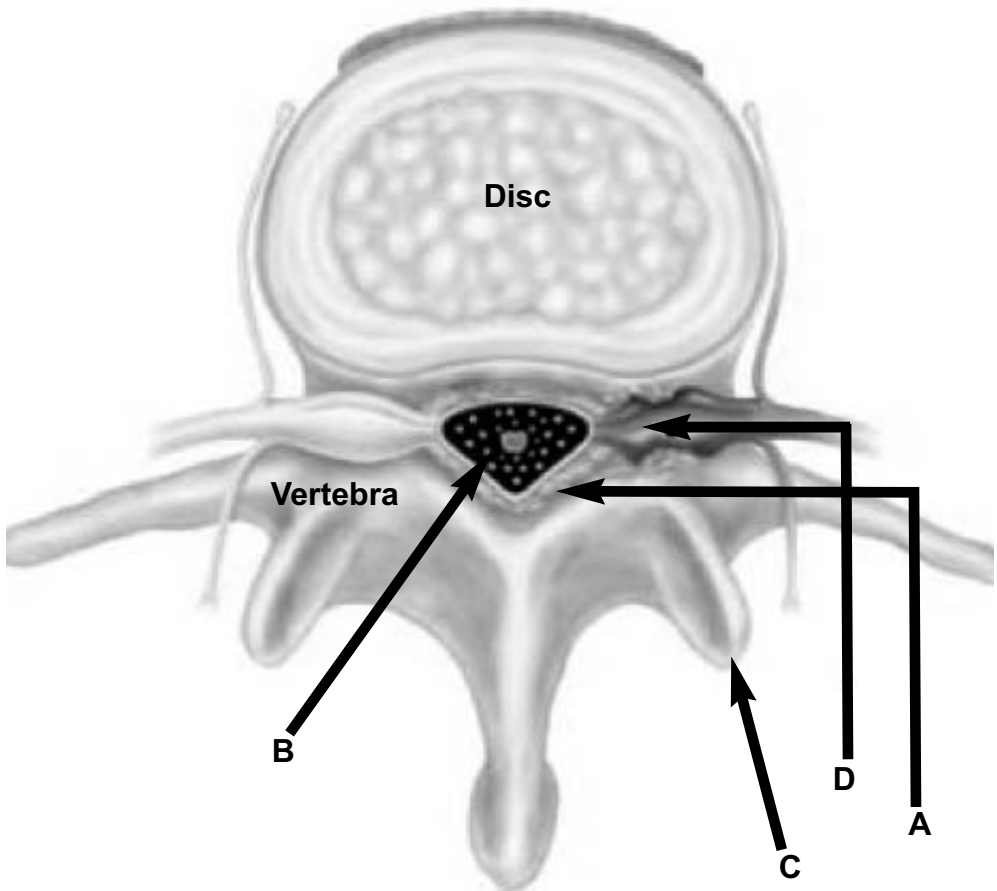


Image used with permission from Medtronic

Figure 5.1

This image depicts spinal stenosis, a condition characterised by a narrowing of the spinal canal.

The thickened ligament (A), called the ligamentum flavum, and the enlarged joints (C) compress the bundle of nerves in the spinal canal, called the Cauda Equina (B), as well as the single nerve root (D) leaving the spinal canal.

My Spine - Lumbar

It does not allow for spontaneous remission as sometimes seen in intervertebral disc disease, but rather has periods of slow deterioration interspersed with periods of quick deterioration in a permanently progressive condition.

What are the symptoms?

The inflamed facet joints and discs lead to local back pain and referred pain to the thoracic spine (chest) and down to the upper part of the legs. The nerve roots that are compressed lead to discomfort and pain in the legs called spinal or neurogenic claudication. This is a discomfort that typically occurs when walking or standing, and becomes better when sitting down. Spinal stenosis is frequently part of a crooked spine (scoliosis). The degenerative discs in combination with the scoliosis compress the nerve roots leaving the spine, causing radicular symptoms (see the chapter *Lumbar Slipped Disc*).

How is it diagnosed?

A clinical examination by your specialist or therapist will allow for a reasonable suspicion, but the only definite way is by doing a magnetic resonance imaging (MRI) scan (see the chapter *Tests and Scans*). Sometimes, because of technical factors, a CT scan is performed (see the chapter *Tests and Scans*). This is usually when an MRI scan cannot be performed due to the unavailability of an MRI scanner, when there are contra-indications to doing a scan or when technical factors such as the presence of certain metal fusion apparatus in the spine make an MRI scan unreliable. See the chapter *Tests and Scans* for the terminology that you will find on your MRI scan report and what it means in plain English.

Other tests that might be used are discograms and nerve blocks. Sometimes EMGs are also used (see the chapter *Tests and Scans*).

My Spine - Lumbar

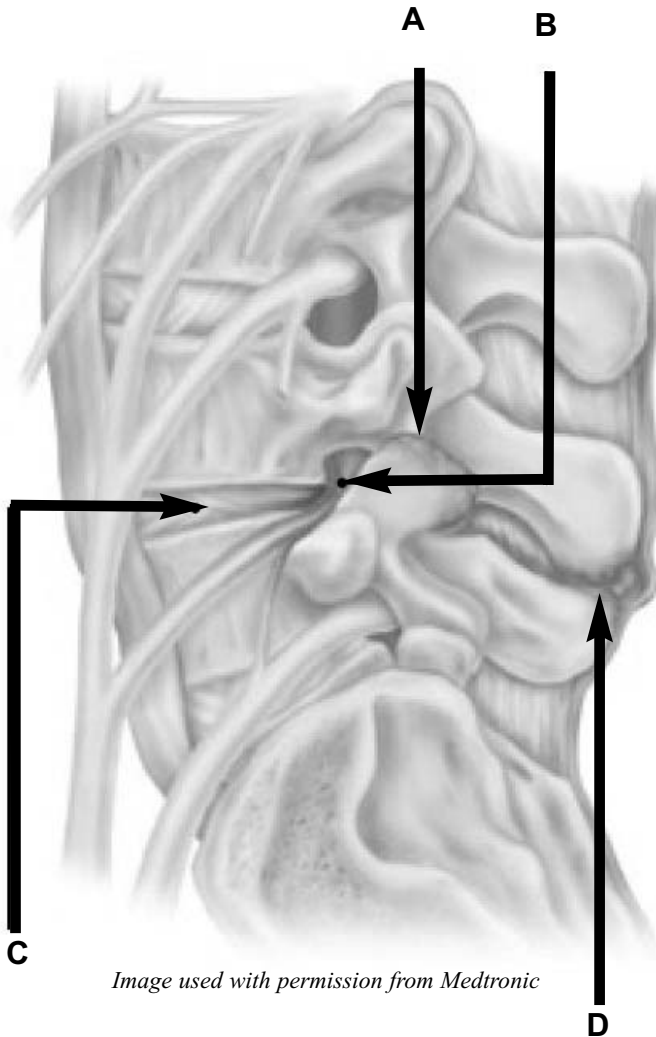


Figure 5.2

This image depicts spinal stenosis seen from the side. The damaged facet joint (A) and the damaged disc (C) leads to the space between the vertebrae collapsing, so much so that the spinous processes (D) touch and rub against each other. The nerve root (B) is clearly being compressed and irritated.

My Spine - Lumbar

How is it treated?

There are always four options:

No treatment – This is acceptable if there is no serious nerve compression – therefore in the absence of spinal claudication or radicular symptoms. There are always people who choose this option for a variety of personal reasons. This is also the option that is chosen in people who have serious medical conditions that does not allow them to have a general anaesthetic. It is rare for this condition to become better without surgery and it usually follows a progressive course whereby the range and severity of symptoms increase.

Treatment that does not require intervention – Courses of painkillers and anti-inflammatory drugs can be combined with treatment from therapists to control symptoms. This is appropriate in patients with limited spinal claudication and radicular symptoms as well as in those patients who are medically unfit to undergo more invasive treatment.

Limited intervention – This include procedures such as caudal or sacral block, radiofrequency rhizotomy and Nucleoplasty. These treatments may be highly effective, have very few side-effects or complications and are performed as day procedures.

Intervention (surgery) – The indications for surgery are:

1. Failed conservative management. This is when painkillers, anti-inflammatory medication and manual therapy such as physiotherapy and chiropractic treatment have been utilised for at least six weeks without improvement.
2. Pain that does not respond to any other treatment modality and is sufficiently severe to the extent that it limits your daily activities and quality of life. This includes local lower back pain, referred pain and radicular pain.
3. Muscle weakness due to nerve compression (radicular weakness).
4. Cauda Equina syndrome and Conus Medullaris syndrome (see the chapter *Lumbar Slipped Disc*).

My Spine - Lumbar

Does this treatment have any complications?

The most common complications of surgery are that of infection and wound haematoma (bleeding under the skin). The most feared complication is that of nerve damage, but this is extremely rare, although not unknown. The outer layer of the nerves (the dura) can also be torn and this will lead to a leakage of spinal fluid (cerebrospinal fluid). This needs to be repaired. Speak to your specialist about a more comprehensive list of possible complications (see the chapter *Your Back Operation*).

What are the long-term expectations?

This is a progressive disease that can be treated without surgery up to a point, but mostly ends up in surgery. Surgery is successful in halting deterioration and is effective in reducing pain in most patients. Walking difficulties in the aged population, may not completely recover, due to the long-standing nerve compression which may in some cases have caused nerve damage prior to surgery.

CHAPTER 6



SPONDYLOLISTHESIS

What is it?

In spondylolisthesis one of the vertebrae slips forward on the vertebra directly below it. This can lead to the compression of the nerves that exit through the foramina. The disc is also damaged by the forward movement of the vertebra. The term spondylolisthesis is a Greek term and is derived from the word "spondylos", which means vertebra, and "listhesis", meaning to slip or to slide.

There are different types of spondylolisthesis:

Inborn (congenital) – In this case the slippage is caused by abnormal bone that does not develop normally at birth and predisposes the vertebrae to slip.

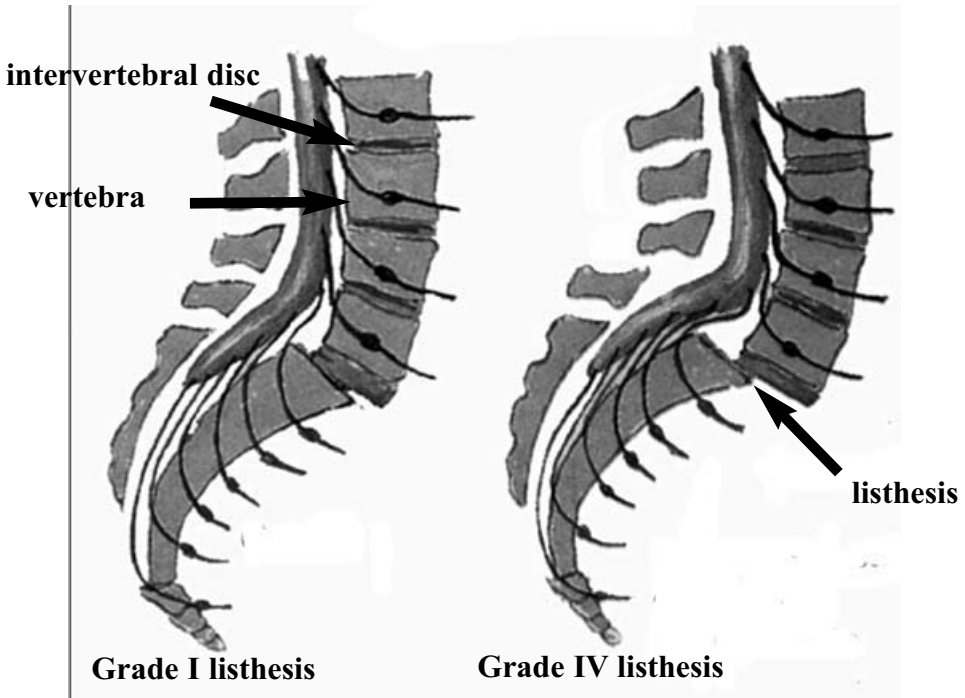
Isthmic – In this case there is breakage of the bony elements that support the joints, which in turn are responsible for keeping the vertebrae in place. This breakage is called spondylolysis.

Degenerative – In this case degeneration of the discs and facet joints leads to slippage of the vertebrae.

Traumatic – Trauma can lead to a fracture of the stabilising complex that houses the intervertebral joint and this in turn leads to the slippage.

Post-surgical – Overzealous decompressions of the lumbar spine during surgery can lead to instability and the inability of the intervertebral joints to stop slippage from occurring.

Pathologic – This is when the bone is weakened by a pathological process such as a tumour, infection, bone disease or osteoporosis.



Images used with permission from Stryker



Image used with permission from Medtronic

Figure 6.1

The top illustration demonstrates the slip of the lumbar vertebrae. The picture on the left depicts a Grade 1 listhesis; the picture on the right depicts a Grade IV listhesis. Treatment consists of decompression of the nerves and fixation of the spine by pedicle screws, as demonstrated in the bottom picture.

My Spine - Lumbar

What are the symptoms?

Back pain is the most common symptom. Many people are, however, unaware that they have this condition and it can be completely asymptomatic. Spondylolisthesis may lead to mechanical back pain and referred pain. When the slippage is so severe that a nerve root is compressed, it can lead to radicular pain (see the chapter *Back Pain*).

How is it diagnosed?

It can be diagnosed on X-ray, CT scan and MRI scanning. There are different grades of spondylolisthesis and the grading is based on the degree of slippage that has taken place of the one vertebra in relation to the other.

- Grade I – up to 25% slippage
- Grade II – 25% to 50% slippage
- Grade III – 50% to 75% slippage
- Grade IV – more than 75% slippage

MRI scanning is used to evaluate not only the degree of slippage, but also whether there is compression of any of the nerves.

How is it treated?

As a general rule, Grade I and Grade II slips can be treated conservatively. The symptoms are generally limited to mechanical back pain and referred pain. These are treated with the usual conservative therapies of analgesic medication, anti-inflammatory medication, physiotherapy and chiropractic treatment. The back can be supported by following an exercise programme overseen by a biokinetician. A brace can be worn for external support. Performing facet blocks and facet nerve denervation by radiofrequency can be very effective. Sacral or epidural steroid injections can also have a positive effect.

My Spine - Lumbar

There are generally only two indications for an operation. The first is ongoing disabling back pain that is not relieved by any conservative measure and a definite loss of quality of life. The second indication is impending permanent nerve damage. This is usually indicated by sciatica (radicular pain) or dysfunction of the nerves that supply the bladder and the bowel as well as sexual function (see the chapter *Back Pain*). The sacral nerves supply the autonomic (automatic) function of bowel, bladder and sexual function and can be compressed if the listhesis is severe.

The first part of the operation is a decompressive laminectomy to free the nerves and this is supplemented by a pedicular screw spinal fusion. This is necessary because the spine is even further destabilised by doing the laminectomy. Please see the relevant chapters for a description and explanation of these operative procedures.

Does this treatment have any complications?

The only complication of conservative therapy is the fact that it might be unsuccessful and therefore not prevent a spinal operation. It should, however, in the absence of impending permanent nerve damage, be the first line of treatment. See the chapter *Your Back Operation* for the list of potential complications of spinal surgery.

What are the long-term expectations?

For Grade I and II spondylolisthesis conservative therapy can be successful in up to 80% of cases. Surgical treatment can be successful in up to 90% of people. There has to be an ongoing commitment from the patient to strengthen their back and to apply good back habits for the rest of their lives (see the chapter *Everyday Life*).

CHAPTER 7



KYPHOSIS AND SCOLIOSIS

What is it?

The spine normally has a straight alignment when viewed from behind and three curves when viewed from the side. The neck (cervical) is lordotic, or curved with the concavity at the back, the chest area (thoracic) is curved in a forward direction, and the lower back (lumbar) is curved once again towards the back.

Scoliosis is a three-dimensional deformity where the spine has an abnormal curvature when viewed from behind. This sideways curving and twisting (rotation) of the spine can result in chest and waist deformity, and the alignment of the shoulder and waist is often altered.

Kyphosis is purely an excessive forward bending of the spine when viewed from the side. There is no associated twist or sideways deformity. Kyphoscoliosis is a condition that comprises both kyphosis and scoliosis.

What causes it?

There are many causes that can lead to these spinal deformities.

They may be due to a birth defect (congenital) where one or more vertebrae fail to develop normally, resulting in asymmetrical growth.



Image used with permission from Dr RN Dunn

Figure 7.1

This reconstructed CT scan demonstrates kyphosis (forward bend) and scoliosis (sideways bend). The malalignment causes spinal instability and can cause nerve root compression.

My Spine - Lumbar

Kyphosis is frequently seen in infective conditions of the spine such as tuberculosis where the front part of the spine (vertebral body) is destroyed and collapses, resulting in the forward curved position.

Many neuromuscular conditions, such as cerebral palsy, spina bifida and muscular dystrophies, cause muscle weakness and long abnormal curves (scoliosis). This can be troublesome in the patient's everyday usage of a wheelchair.

Inadequately treated fractures from trauma may result in both kyphosis and scoliosis.

Common causes include the group described as "*idiopathic*" (where the cause is unknown). This is a well-recognised group of young, tall, slim girls developing scoliosis during their teenage years as they go through their growth spurt.

In later life, asymmetrical discs and facet joint (the joints between the vertebrae) degeneration may cause segmental instability and degenerative (wear and tear) scoliosis.

What are the symptoms?

Symptoms vary based on the cause. Congenital (inborn) deformities may be incidentally picked up on a chest X-ray done for other reasons, as these children often have other associated problems with their kidneys and hearts.

The *idiopathic* group is often noticed at around 10-12 years of age when a posterior thoracic (torso) prominence is noted or hip or shoulder asymmetry. It is usually not painful. There may be breast asymmetry which concerns the young teenage girl.

The *degenerative* group usually presents with both back and leg pain due to narrowing of the spinal canal and nerve root foramina, which causes compression of the lumbar nerve roots. These patients may also complain of progressive loss of height and increasingly prominent hip bones.

My Spine - Lumbar

How is it diagnosed?

Once the deformity is noticed by the patient, the treating specialist will ascertain the history to define the cause. A clinical examination will include the forward bend test which exaggerates the chest wall prominence around the shoulder blades.

The diagnosis is confirmed on a full-length X-ray taken both from behind and the side while standing. Further views in flexed or extended positions may be needed to determine the flexibility of the curve. MRI and CT scans may assist in determining the underlying cause.

How is it treated?

Any dangerous underlying factors need to be excluded. If the deformity is mild, the patient may be carefully monitored and if no progression occurs, left untreated. If progression is expected based on the patient's age, curve size and type, intervention is required.

Bracing is an option, but with poor compliance it is not always successful. Patients find it hard to wear the brace for the required 20 hours per day. Surgery is the mainstay of management of the larger, progressive curve; it is dealt with in a later chapter.

Does this treatment have any complications?

All surgery involves risk. The general risk of infection is present and relatively low at around 0.8%. It is lower with the anterior approaches. There is a risk of non-union, or failure of the bone to fuse. Should this occur, the instrumentation will fatigue and break at around 12-18 months post-operatively with pain and a loss of correction.

My Spine - Lumbar

The risk most feared is neurological injury (paralysis). Although this risk is ever present, it is rare, with a chance of 1:300 of any neurological event from some numbness to total paraplegia (unable to move or feel legs). This can occur from the corrective process and increased strain on the spinal cord or from reduced blood supply to the cord.

To reduce this risk, some specialists use spinal cord electrical monitoring during the procedure, although this is not fail-safe and has its own technical challenges. Should there be a problem in the immediate post-operative phase, urgent instrumentation removal may be required. Speak to your specialist about a more comprehensive list of possible complications (see the chapter *Your Back Operation*).

What are the long-term expectations?

This depends on the type and underlying cause. Severe scoliosis, greater than 70 degrees, poses a risk to lung function, and greater than 100 degrees increases the risk of mortality. Smaller curves remain a cosmetic and psychological issue, but not a medical threat.

Curves less than 40-60 degrees in the younger age group usually will not progress after maturity and do not have an adverse effect on enjoyment of life. Curves greater than 60 degrees will progress and surgery should be considered.

The degenerative type tends to progress and increasingly causes nerve root pain.

CHAPTER 8



TESTS AND SCANS

There are several tests that your specialist may want to perform to confirm your diagnosis. It is important to understand how these tests work, why your specialist orders them and what the terminology means in plain language.

What is a CT scan (CAT scan)?

Computed tomography or CT scans have been with us for many years and are performed for many different disease entities. A CT scan is made up of ordinary X-rays (tomograms) that are fed into a computer (computed). They can be performed with a contrast medium (dye) that is injected into the patient's veins. This contrast medium is usually iodine-based and circulates in the vascular system of the body. It is taken up in areas where there is increased blood flow such as areas of inflammation, infection or cancer. It is also used to examine patients' arteries and veins.

A CT scan is the best test to evaluate the integrity, alignment and pathology of the vertebrae of your spine. It is, however, not as effective when evaluating the softer tissues such as discs, ligaments and nerves. MRI scans are the best for evaluating softer tissues.

When undergoing a CT scan, you are placed in a large machine that is shaped like a doughnut. The table you are lying on will move forward and backward as the scan is being performed. Older-generation CT scanners could do only one slice (exposure) at a time; modern scanners do many cuts at the same time and are much faster.

My Spine - Lumbar



Figure 8.1

This is a picture of a CT scan machine. The large square part in the back with the round opening is where the X-rays are generated around the patient. This is called the gantry and can be inclined at angles to allow for better visualisation of the tissues of the body.

Modern scanners are called spiral CT scan machines and can currently take many images at a time. The table moves with an electric motor and allows the X-rays to pass over different tissues of the body as the patient passes through the gantry. CT scan machines generate a large amount of radiation and a CT scan should therefore only be performed for specific clinical indications.

My Spine - Lumbar

What is an MRI (magnetic resonance imaging) scan?

This scan is performed with magnetism. A very large magnet aligns and realigns the molecules of the body and a computer then interprets the signals that are received and turns them into images. These images are really very clear and all the tissues in the body can be seen in great detail. As with CT scans, contrast can be used to give greater detail to blood vessels and also to indicate inflammation and cancer.

Since this technology works with a large magnet, patients who have certain metal implants cannot undergo this test.

When you undergo this test you will be placed in a machine that has a narrow tunnel and claustrophobic patients frequently need some form of sedation for this procedure. The machine makes quite a lot of metallic banging and clattering noises and you will usually be offered earphones to block out the noise and in some institutions soft music is piped through these.

Several types of pictures are taken. The most frequently used images are T1-weighted and T2-weighted scans. This is a description of the different ways that the scan manipulates the magnetic field of the tissue that is being examined. It is not important to know anything about the difference between these different types of MRI pictures that are taken.

It is, however, useful to know that there are several cuts (planes in which the body is examined) that are done. The most frequently used cuts are the sagittal images. These are images that are taken of your body from a side-on view. They are very useful in giving an overview of the spine in its entirety.

The images that are more important for depicting the finer detail of the pathology are the axial cuts or planes that are taken straight through the spine and are like slices taken of a sausage. The nerves that are leaving through the foramina are seen side-on and look like little worms as they leave the spinal canal. This way your specialist can see a lot of detail about the nerves and any compression of the nerves.

My Spine - Lumbar

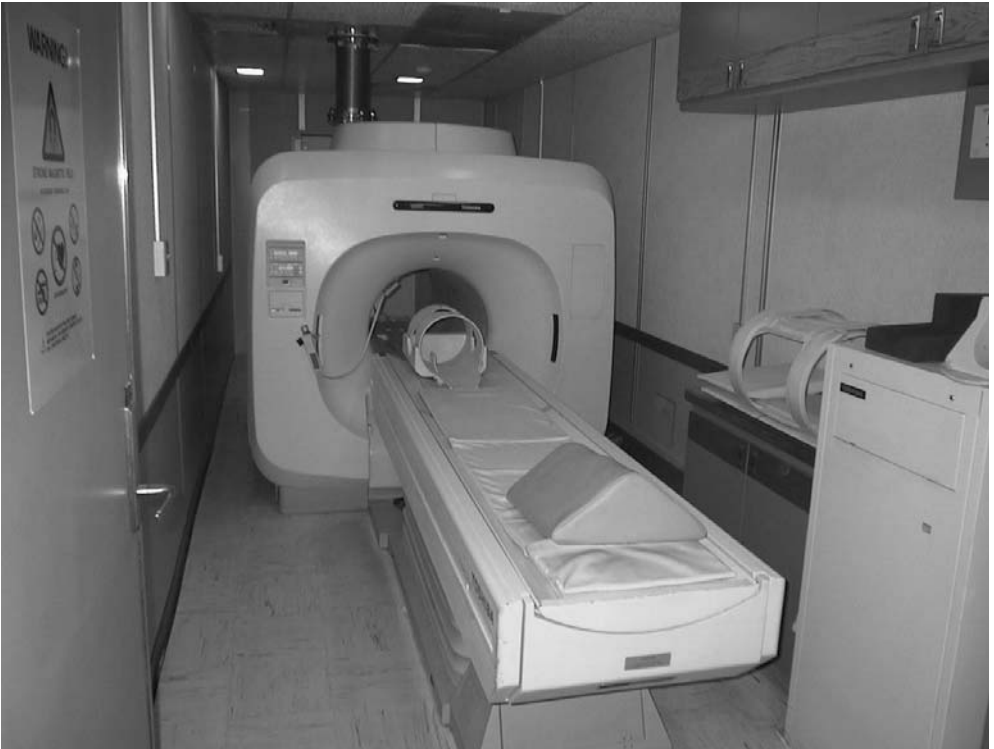


Figure 8.2

This is a picture of an MRI scan machine. The section that generates the magnetic field is a tubular structure and patients are moved into this cave-like tube on the table, which has an electric motor. The room is devoid of loose metallic objects, as these would become airborne when the machine is activated because of the magnetic field, which is extremely powerful. Objects such as the magnetic strips on bank cards are rendered useless by the machine, so make sure that you leave these outside the room.

These machines tend to be quite noisy on the inside with all manner of tapping and banging noises. These are perfectly normal and you should not be alarmed by them. Some institutions will have earphones with music available to reduce the noise.

My Spine - Lumbar

There are other cuts as well, such as coronal cuts where the body is viewed from front to back. Both coronal cuts and sagittal cuts are useful for revealing the alignment of the spine. The coronal cuts demonstrate scoliosis well. Scoliosis is where the spine is bent (has an abnormal curve) when viewed from the front. The normal curve of the spine can be evaluated on the sagittal views.

When the curve is more pronounced to the front, it is called kyphosis and when it is more curved towards the back, it is called lordosis. The coronal cuts are also useful for evaluating the nerve roots as they leave the spinal canal through the foramina and can demonstrate extraforaminal (outside of the foramen of the spinal canal) disc compression of the spinal nerves.

What is a myelogram?

This test is performed with a contrast agent that is injected into the spinal canal with a technique called a lumbar puncture. The patient is placed on a table that can tilt and is tilted so that the contrast medium can run up and down the spinal canal. A CT scan of the spine is performed at the same time and images are then generated that can indicate whether there is an obstruction of the nerves of the spine. This procedure has mostly been replaced by MRI scans. It is still performed in cases where patients cannot undergo an MRI scan due to certain metal implants in the body and for other specific indications.

What is an electromyogram (EMG)?

This is a test of the electric conductivity of the nerves of the body. This can be done by measuring the transit time in nerves and measuring the response in the muscles that are supplied by these nerves. The measuring instrument is a small needle that is placed in the muscle and then connected to a machine that measures very small electric impulses. When your specialist receives a report that there is slowing in transit time in one of the nerves, this may indicate, among other things, that the nerve is being compressed by a lesion like a slipped disc.

My Spine - Lumbar



Figure 8.3

This is a picture of an EMG machine. It has several wires that are attached to electrodes inserted with small needles into the muscles of your arm or leg. It has a recording facility that measures the flow of electricity in your nerves to identify which of these nerves are being compromised.

My Spine - Lumbar

What is a discogram?

In this test, contrast (dye) is injected with the help of fluoroscopy (mobile X-ray machine) directly into the intervertebral disc. The test has two elements. The first element is when your specialist attempts to mimic your pain by injecting fluid into your disc and therefore tries to place stress on the disc. This is a diagnostic test that can be very difficult to interpret. The other element is looking at the image on the fluoroscopy to see what the fibres of the disc look like and to see whether there is any damage.

What is a radio isotope scan?

In this test, radio isotopes are injected into a vein and allowed to circulate. A scan is then performed, which picks up radio isotope uptake. The radio isotopes are taken up in bony areas of the body where there is inflammation and will help your specialist decide where the main inflammation is located that causes your pain.

Terminology in the lumbar region for CT scans and MRI scans

Spinal stenosis – This means that the spinal canal is narrowed. This is usually because the joints that are between the vertebrae, called the facet joints, have hypertrophied (become larger) secondarily to osteoarthritis of these joints. At the same time the ligament that runs inside the spinal canal, the ligamentum flavum, has also hypertrophied and is pushing on the nerves. The third component that causes spinal stenosis is the pressure from discs that push into the spinal canal.

Facet joint hypertrophy – This is when the joints between the vertebrae become large and irregular. This is because the joints are damaged by arthritis (osteoarthritis).

My Spine - Lumbar

Annular tear – This describes the condition where the intervertebral disc has early damage. The damage comprises of a tear in the annulus fibrosus (see the chapter *Anatomy of the Spine*). The tear causes different inflammatory substances to be released by the body and this can cause local back pain, referred pain and even radiculopathy (see the chapter *Lumbar Slipped Disc*).

Disc bulge – This describes the condition where the nucleus pulposus (see the chapter *Anatomy of the Spine*) starts to bulge through the damaged annular fibres.

Disc herniation/ disc extrusion – Both these terms mean that a portion of the nucleus pulposus has now extended outside of the confines of the annular fibres into the spinal canal (see the chapter *Lumbar Slipped Disc*).

Broad-based disc herniation – This is where the disc is damaged extensively and there is usually a decrease in the height of the disc and the disc looks a bit like a flat tyre with the whole or a large part of the nucleus projecting beyond the confines of the annular fibres.

Foraminal disc herniation – In this case the disc herniation is on the side of the spinal canal where the nerve roots leave the spinal canal through the foramina. Even relatively small disc prolapses or hernias can cause a lot of pain or even weakness, as the space is very restricted in this area.

Extraforaminal disc compression – In this instance the nerve is compressed outside of the spinal canal and outside of the foramen as it leaves on its way to the leg. This is usually caused by a broad-based disc herniation.

Central disc herniation – This is where the disc herniation is in the middle of the spinal canal. Since this is a fairly large space, the disc herniation needs to be fairly large compared with a foraminal disc prolapse before symptoms occur. In some cases the spinal canal is already partly occluded by facet joint hypertrophy and compression from the ligament inside the spinal canal – the ligamentum flavum – and even small disc herniations can cause symptoms in these cases.

My Spine - Lumbar

Thecal sac – This is the name given for the elongated membranous tube that extends from the brain to the end of the spine in which the spinal cord and nerve roots run. It is made up of – and is continuous with – the membrane that covers the brain.

Flattening of the thecal sac – This is a description of the situation that occurs when a herniated (slipped or prolapsed) disc has extended so far into the spinal canal that it is pushing on the thecal sac.

Nerve root – This is the nerve root that leaves the thecal sac and exit the spine through the intervertebral foramen. Most of the exiting nerve roots can be seen side-on in the axial planes as well as the coronal planes and are seen end-on in the sagittal plane.

Foraminal stenosis – This is a narrowing of the foramen and the exiting nerve root can become compressed in the foramen by either a disc herniation or a hypertrophied facet joint or a combination of both.

Spondylolisthesis – This is the term that describes a slip of one vertebra on the vertebra directly below and is secondary to a weakness in the bone that supports the facet joints that keep the spine stable.

Spondylolysis – This is frequently the cause for spondylolisthesis and is the process where the bone supporting the facet joints is weak and fractures.

Spondylosis – This is spinal degeneration and is characterised by bone spurs (osteophytes) that develop on the vertebral bodies and are usually asymptomatic, except if they compress nerves.

Synovial cyst – The joint space of the facet joints are lined with a membrane – the synovial membrane – which allows for free and easy movement of the joint. Sometimes, as the joints become damaged, this synovial membrane can bulge out and form a cyst.

My Spine - Lumbar

The cyst is filled with synovial fluid that is usually found in the joint space for lubrication. These are completely benign (harmless) lesions and should not be confused with cancerous lesions. They can, however, cause nerve compression and foraminal stenosis.

Tarlov cyst – This cyst is filled with spinal fluid and develop in the membrane that covers the nerve roots. If it is large, it can cause nerve compression and pain. Surgery for this benign lesion can be difficult. The diagnosis is made based on the fact that the cyst is in direct contact with a nerve root.

Arachnoid cyst – This is also a benign lesion and is formed from the inner layer of the covering of the spinal cord. It is usually asymptomatic and will only require surgery if it is very large and is causing symptoms secondary to nerve compression.

Cauda Equina – This term is Latin for horse's (*Equina*) tail (*Cauda*). It describes the nerve roots that dangle down from where the spinal cord ends and looks like a horse's tail. The spinal cord ends at approximately the level of the first lumbar vertebra. When these nerve roots become compressed the resulting syndrome of pain, weakness and paraesthesia (pins and needles) in the legs with associated bladder and bowel dysfunction is called Cauda Equina syndrome. This is a spinal emergency and requires immediate surgery.

Conus Medullaris (Conus) – This is the name given to the end of the spinal cord. It has a tapered conical shape and the nerve roots of the Cauda Equina exit from here. It is usually at the level of the first lumbar vertebra.

Filum Terminale (Filum) – This is the continuation of the conus medullaris and is the thin cord-like structure that extends down to the end of the spinal canal.

CHAPTER 9



BACK PAIN AND EMOTIONAL DISTRESS

Pain is a complex experience that includes both physical and psychological factors. Pain can be defined as "an unpleasant sensory and emotional experience associated with actual or potential damage, or described in terms of such damage." Acute pain can frequently lead to emotional reactions such as fear and anxiety.

A large part of the fear and anxiety that accompany spinal pain is the unknown underlying cause of the pain and the uncertainty around the effect that this may have on the patient's everyday life.

Knowledge about the condition, the treatment and expected outcome is paramount in countering the emotional reaction associated with the pain and aids in faster and more complete recovery.

Important steps in conquering the emotional effects of pain

1. The underlying condition must be diagnosed and defined.
2. The expected treatment and possible success should be outlined.
3. The prognosis should be established.
4. Both physical therapy and treatment to reduce pain should be instituted as promptly as possible, as this will prevent a cycle of ongoing pain and fear to develop.

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What do you need to know?

Understanding your condition is paramount for successful treatment. It is important to ask your specialist as many questions as you can.

When you have asked all your questions and have made sure that you understand the answers, you should write them down and then do thorough research. Talking to other patients is rarely helpful, as they would most likely have a different cause for their back pain and misinformation is much more dangerous than no information. Other patients will also frequently have preconceptions and misconceptions about the nature of back pain as well as its treatment.

The internet is a good source of information, as are information leaflets and books written by professionals. It is important to go back to your specialist following your research and clarify anything that you are still not sure about.

The (vicious) cycle of pain

The effects of acute pain are many and varied. Acute pain can cause enormous amounts of stress and anxiety in patients. The factor of the unknown, the reduced ability to deal with everyday life, anger, uncertainty and fear combine in a heady cocktail that can spell disaster. Certain types of personality traits and also certain perceptions or misconceptions add fuel to the fire. Think for instance of the anxious type of person who has seen a family member have a bad experience with spinal pain, perhaps compounded by unsuccessful treatment or surgery.

The enormous amount of stress that the pain, the associated fear and anxiety and burdens of everyday life can place on a person are usually detrimental to a normal sleeping pattern. If you add the physical effects of pain, a vicious cycle develops.

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During certain stages of deep sleep, an important hormone called serotonin is released by the body. This is a natural pain killer (endorphin, so-called because it is the body's own morphine) and is also important in combating depression. Reduced sleep leads to fatigue, which makes the perception of pain more acute and also reduces the levels of endorphins (serotonin) secreted because of lack of sleep. This reduces the body's ability to fight pain and causes depression.

Making sure that you sleep properly is therefore of paramount importance. This can be achieved by ensuring that you have adequate pain relief from anti-inflammatory medication as well as simple analgesics and that their administration times allow you to have a good night's rest. Certain drugs such as amitriptyline increase the levels of serotonin and are also sedative without having addictive properties and can be taken on a chronic basis.

In patients where neglected pain is not managed properly and promptly, chronic pain may develop. The problem with chronic pain is that instead of becoming used to pain, patients become less able to deal with pain and their perception of pain changes. This means that instead of being able to tolerate pain better, they become less tolerant of pain and even if treatment at this stage is partially successful, the level of pain that would previously have been perceived as acceptable or tolerable, is now perceived as intolerable.

Action plan to avoid depression and anxiety associated with pain

1. Know and understand the source of the pain.
2. Understand the consequences of the condition as well as the long-term outlook.
3. Understand the possible treatment as well as your individual treatment plan and make sure that you do not have unrealistic expectations.

My Spine - Lumbar

4. Make sure you follow the treatment to the letter as well as any physical therapy that is prescribed. Report back if the treatment is not effective so that your specialist may adjust your treatment.
5. Sleep is of paramount importance; this cannot be stressed enough.
6. Adjust your daily activities to cope with your condition. Be frank with your employer and make them part of your rehabilitation process. Keep them updated and they will support you much better than if you hide your condition or keep them in the dark.
7. Depression and anxiety are normal adaptive responses to severe pain and if these manifest, treatment by a professional that may include counseling as well as antidepressants can be invaluable.

CHAPTER 10



GOING TO THEATRE

The sterile environment of a theatre complex, out of necessity, is not a welcoming and warm place. For your safety the walls are bare and unnecessary furniture is not allowed beyond what is needed to perform the procedure. Operating theatre equipment is designed with functionality in mind and is not known for their aesthetic qualities.

Specialists dressed in sterile clothes appear drab and wear caps to keep hair covered and face masks, which often make them appear unfriendly and forbidding. Specialists and theatre staff are, however, used to these surroundings and to them it is a welcoming, well-known area in which they make their daily living and they see past the drab surrounds.

It is important to realise that the drab and seemingly severe surrounds are merely a function of necessity for your safety and well-being and the specialists despite their environment, are just ordinary people going about their daily task.

It is important to know what the different pieces of equipment in theatre are and how they will ensure a safe and successful procedure. It is also important to understand the routine in theatre and what process is followed. This will reduce your anxiety and uncertainty and will make it an interesting and informative experience, rather than an alarming one.

My Spine - Lumbar

It is important to visit the hospital prior to your procedure to familiarise yourself with the ward, the theatre and the recovery area as well as enquire as to exactly what will happen on the day of your operation. Most hospitals employ a public relations officer or client services manager or have a pre-admission clinic to assist you with these arrangements.

The following information will illustrate a typical routine visit to a hospital for an elective procedure, with illustrations of some of the equipment that will be used during the procedure.

ADMISSION

Admission Desk

It is typical that if your operation is scheduled in the morning that you will be admitted to the hospital very early in the morning. It is important therefore to have the household well prepared for this. Your spouse, friend or family member will ordinarily accompany you to the hospital and this will obviously mean that work related matters as well as childcare matters are arranged timeously.

The first port of call will be the admission desk where certain paperwork will have to be completed. This is usually to administer the hospital account. You will need to ensure that you check beforehand what kinds of documentation will be required. This will typically include identity documents, medical insurance authorisation, agreement to co-payments, guarantee of payment and may even include a cash deposit.

Most institutions have pre-admission facilities where this can be dealt with during office hours before the admission date, making the admission process easier on the day of your procedure.

My Spine - Lumbar

The Ward

You will be taken to the ward and made comfortable in your bed. A member of staff will take your blood pressure, temperature and weight. You will also be asked specific questions about your health, possible allergies to medication, previous anaesthetic complications and whether you fully understand your planned procedure. Many of these functions will also be performed at a pre-admission clinic, streamlining your admission. You will be given a theatre gown to wear, which fastens behind your back and is not very flattering, but specifically designed to be functional. The anaesthetist will consult and examine you in the ward to ensure the use of the safest and most appropriate anaesthesia based on your history, examination and planned procedure.

Your valuables may be locked away by the staff for safe keeping. You will be informed of your approximate time for theatre, but you have to be aware that this may not be accurate and your operation may even be delayed for several hours as theatre lists can be prolonged by many technical factors as well as emergencies.

Theatre

You will be fetched by a porter and brought to theatre on your bed. It can be quite disconcerting and most people become quite anxious. To reduce anxiety a light sedative is frequently administered in the ward as prescribed by the anaesthetist.

At the theatre doors, you will be handed over to theatre personnel and they will verify with the ward staff that you are the correct patient and that you have been booked for the correct procedure. They will also ask some basic questions and verify that all false teeth, jewelry and aids have been removed. You will then be taken to a waiting area.



Figure 10.1 The anaesthetic machine

This machine has a supply of different gases including oxygen, ordinary air and nitrous oxide and mixes anaesthetic gases into the flow of oxygen and air mixture that is pumped into and out of your lungs by the ventilator. The machine also removes the carbon dioxide that you exhale. The canister at the bottom of the tray with the granules inside is responsible for removing the carbon dioxide. There are valves that regulate the flow as well as flow meters to indicate the flow rate. Soft tubes connect you to the machine to deliver a clean air and gas mixture and to remove the air that is exhaled.

The machine has an extensive monitoring function to perform and it measures the amount of the different gases that enter and exit your body, the concentration of oxygen in your blood, your heart rate and rhythm and your blood pressure. It has several alarms and fail-safe mechanisms to keep you safe and to alert the anaesthetist of possible complications.

My Spine - Lumbar

When it is your turn, you will be taken from the waiting area to the operating theatre. In theatre you will be helped onto the theatre table. An anaesthetic nurse will connect an oximeter, by means of a soft rubber hood that is placed on your finger, which measures the oxygen concentration in your blood.

The nurse will also connect a blood pressure cuff to monitor your blood pressure and place ECG (electrocardiogram) stickers on your chest that will monitor your heartbeat throughout the procedure. The anaesthetist will place a drip needle into one of your veins and start an infusion (drip). A breathing mask will be held over your mouth and nose with an odd smelling gas to be inhaled. This is the anaesthetic gas that will anaesthetise you. You will remember very little about this part of the procedure.

A breathing tube will be inserted into your windpipe (trachea) through your mouth if you are going to have a full anaesthetic and a ventilator will control your breathing for the duration of the procedure. Once you are anaesthetised, care will be taken to protect your eyes and any part of your body that may experience direct pressure for a prolonged period.

The skin surrounding the area where the incision is going to be performed will be prepared with an anti-bacterial solution. The specialist and scrub sister will do the same by washing and scrubbing their hands with anti-bacterial solutions and scrubbing brushes. They will then don theatre gowns and face masks. The operation site and the rest of your body will be carefully draped with special sheets to cover the areas that have not been cleaned. Your operation will be performed under the strictest sterile conditions possible.

At the end of the operation a drain may be placed in the wound to drain away any excess blood and body fluid to ensure that the wound heals properly and the skin edges are closed with sutures, metal surgical clips or even surgical glue.

My Spine - Lumbar

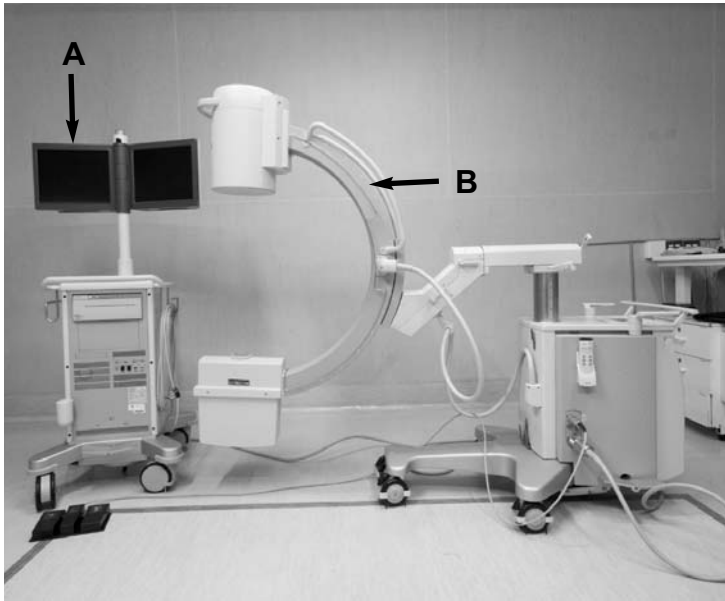


Figure 10.2 The mobile X-ray machine (fluoroscopy unit)

This mobile X-ray machine is used extensively to confirm the anatomy and position of the bony structures of the spine as well as confirming that the level of surgery performed is the intended level. It is also used to confirm that spinal instrumentation is properly inserted and fixed if there is any instrumentation required for your procedure.

*It has two heads fixed on a C-arm (**B**) and this generates and receives the X-ray beams. The screen (**A**) shows the resulting images and modern machines have recording functions and can even measure distances.*

My Spine - Lumbar

You will be moved over to your bed with a roller-board and taken to the recovery room where you will be kept until fully awake. You will be transferred to the high care unit or the ward. If you spend the night in the high care unit, you will be transferred to the ward as soon as your specialist is confident that it is safe.

Equipment used in theatre

The anaesthetic machine

This machine has a supply of different gases including oxygen, ordinary air and nitrous oxide and mixes anaesthetic gases into the flow of oxygen and air mixture that is pumped into and out of your lungs by the ventilator. The machine also removes the carbon dioxide that you exhale. The canister at the bottom of the tray with the granules inside is responsible for removing the carbon dioxide. There are valves that regulate the flow as well as flow meters to indicate the flow rate. Soft tubes connect you to the machine to deliver clean air and gas mixture and to remove the air that is exhaled.

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The C-arm or mobile fluoroscopic X-ray machine

This mobile X-ray machine is used extensively to confirm the anatomy and position of the bony structures of the spine as well as confirming that the level of surgery performed is the intended level. It is also used to confirm that spinal instrumentation is properly inserted and fixed.



Figure 10.3 The operating microscope

The operating microscope is frequently used in spinal surgery as a light source and magnifying instrument so that the specialist can clearly see the tissue and especially the nerves when operating. Modern microscopes are magnificent machines and are very easy to use and have multiple functions such as navigation abilities to steer the specialist through different tissues, recording abilities, the ability to take pictures and a host of user specific settings to make surgery a safer procedure.

Some specialists prefer to use a headlight that is attached onto their forehead by a headband for illumination and operating loupes for magnification. Loupes are cylindrical mini telescopic glasses that can be attached to a pair of spectacles or the headband of the headlight to allow for magnification of the tissue.

My Spine - Lumbar

The operating microscope

Many operations to the spine require that the different types of tissue are magnified so that the specialist can discern the nerves from the other tissues. Some specialists use operating loupes, which are special glasses that have telescope-like lenses that magnify the tissue. Other specialists use an operating microscope, which is a large machine that both illuminates the tissue and also magnifies the tissue more than an operating loupe.

The theatre table

Most spinal specialists will use a specially designed theatre table made out of carbon-fibre, which is designed to allow the specialist to use the C-arm to see the vertebrae and any instrumentation used, without interference from the metal of an ordinary operating table. There are movable pads for the patient to lie on so that they do not develop pressure sores.

The table is also adjustable at different angles and heights to assist the specialist to see the tissues of the spine more clearly and to operate in a comfortable position.

The diathermy machine

The diathermy machine is used to coagulate bleeding blood vessels and is used to dissect tissues with. It makes use of an electrical current and can generate enormous amounts of heat at the tip of the working probe.

The cell saver

In long and complicated spinal procedures or procedures in which moderate to severe blood-loss is expected, a cell saver may be used. This is a device that is connected to the suction unit and all the blood that is sucked up during the procedure is washed inside the machine in a saline solution and impurities are removed. The blood can then be given straight back to the patient through the drip.

My Spine - Lumbar



Figure 10.4

The picture above demonstrates a regular set-up in a spinal theatre. The theatre table in the foreground is a specialised spinal surgery table which is composed to a large degree of carbon-fibre and has no central supporting post. This allows for the X-ray machine to pass underneath and for the X-rays to penetrate through the table, allowing the specialist to visualise the anatomical structures and instrumentation used in spinal surgery.

Note the X-ray machine in position as it would be utilised during surgery. The screen is positioned at the top-end of the table so that the specialist can see it comfortably without having to turn his head. In the background the anaesthetic machine is positioned close to the patient's head for optimal safety, so that the anaesthetist is as close as possible to the patient's all important airway.

It is important to understand that there are many variations on this theme and that your specialist might utilise a completely different set-up for technical and practical reasons that prevail in your area.

My Spine - Lumbar

Spinal nerve monitoring

In some procedures and especially in scoliosis surgery, this technology may be used. Scoliosis is where the spine is bent and has to be straightened with rods and screws. This may place the nerves under stress and this system will warn the specialist if the nerves are being compromised and will allow the specialist to modify the procedure to be able to protect the nerves. There are, however, definite technical challenges to this technology at this stage.

Neuro-navigation

Some specialists use a computer that helps them identify the different structures and is useful in placing screws in the correct position away from the fragile nerves. These computers use a system of known reference points to calculate where the specialist's instrument is in relation to the tissue.

CHAPTER 11



ANAESTHESIA

Before you come into hospital

Here are some things that you can do to prepare yourself and reduce the likelihood of difficulties with the anaesthetic. If you have asthma, emphysema, any heart condition or other chronic disease, you will be evaluated by an anaesthetist or specialist prior to surgery.

If you have loose or broken teeth, or crowns that are not secure, you may want to visit your dentist for treatment. The anaesthetist may need to put a tube in your throat to help you breathe, and if your teeth are not secure, they may be damaged.

Pills, medicines, herbal remedies and allergies

If you are taking any pills, medicines, herbal remedies or supplements, it is important to bring these with you. A written list of everything you are taking, whether they have been prescribed or whether you have bought them over the counter, would be helpful. If you have any allergies, a note of these will also be helpful.

Please note that the use of blood-thinning medication is dangerous if not stopped in time before surgery due to the decreased clotting that blood-thinning medication causes.

My Spine - Lumbar

This can lead to uncontrollable bleeding during surgery. It is important to stop taking aspirin at least 10 days prior to surgery. If you are taking Warfarin, this should be stopped according to instructions from your specialist or anaesthetist. If you are taking other chronic medication it is important that you check with your specialist whether you should be taking these on the morning of surgery or not. If you are not sure, your anaesthetist will advise you.

On the day of your operation

You will be asked to come in well in advance of your scheduled operating time to allow enough time for your admission to the ward, and for the nurses to go through the anaesthetic check-list with you. Unfortunately it is not possible to give you an exact time that you would be going to theatre, and it may be that you have to wait a long time before you go to theatre, since operating times can be very unpredictable.

The anaesthetist will consult with you before your anaesthetic to ensure that the safest and most appropriate anaesthetic is administered.

Nothing to eat or drink - fasting ('Nil by mouth')

If there is any food or liquid in your stomach during your anaesthetic, it could come up into the back of your throat and then go into your lungs. This could cause serious damage to your lungs. You should not eat or drink anything for at least six hours prior to surgery. If, for instance, you have been told to arrive at 10h00, you may usually have some clear fluids at 06h00 the morning of your surgery. It is important to check with your specialist about this.

Premedication

Premedication (a 'premed') is the name for drugs (tablet) that are sometimes given before an anaesthetic, although today they are not always used. They are used to sedate and calm you before your operation.

My Spine - Lumbar

The theatre

When you are taken into the operating theatre, your anaesthetist will prepare you for your anaesthetic. Several people will be there, including your anaesthetist and the anaesthetic assistant. All the checks you have just been through will be repeated once again.

To monitor you during your operation, your anaesthetist will attach you to machines to monitor:

Your heart: self-adhesive patches will be placed on your chest (electrocardiogram or ECG).

Your blood pressure: a blood pressure cuff will be placed on your arm.

The oxygen level in your blood: a soft rubber hood will be placed on your finger (pulse oximeter).

Setting up your cannula

Your anaesthetist will need to administer drugs into a vein. A needle will be used to put a thin plastic tube (a cannula) into a vein in the back of your hand or arm. This is taped down to prevent it from slipping out. A special bag of sterile water with added salt or sugar (a drip) will be connected to the cannula.

What happens during a general anaesthetic?

Before starting the anaesthetic, you may be given oxygen through a face mask. This will be the last thing you remember before waking up. For some operations the anaesthetist will place a breathing tube down your windpipe (trachea) once you are unconscious. You will not be aware of this tube being used.

You will wake up in the recovery room where you will be looked after by trained staff. You may have an oxygen mask on at first.

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How will I feel afterwards?

Most people feel fine, but occasionally you may find yourself shaking as though you are very cold. This is quite common and soon stops. Some patients may have a painful throat and dry lips, possibly because of the presence of the breathing tube during anaesthesia. This usually clears up after a day or two. Rarely you may experience some muscle aches. These are most common across the shoulders and neck and may last for a few days. Ways of treating pain is discussed elsewhere in this chapter.

You may feel nauseous or vomit after operations although this is less likely with modern anaesthetics. Please inform the anaesthetist if this has been a problem for you before so that steps can be taken to reduce the chances of it happening, or treat it if it occurs.

Some people experience tiredness after an anaesthetic that may last several days. Your anaesthetist will try to relieve any discomfort you may have. You might be repositioned before the onset of surgery. We take great care with positioning, and use padding for all pressure points. However, on occasion patients have body aches from being in the same position for a long time.

After the operation

After the operation you will be moved to a recovery room where your condition will be monitored. The drip is not usually needed for any longer than about 24 hours after the operation. Your operation site may be quite painful at first and initially you may be given injections to ease the pain (or a PCA - see the section in this chapter); when the pain has lessened, tablets can be given. Your surgery may be discussed with you in the ward by the surgical team.

My Spine - Lumbar

What are the risks?

Anaesthesia is safer than it ever has been before, but all medical treatments carry some risk. Some nerves are at risk of being compressed due to the position you lie in when unconscious. Very rarely, numbness and weakness may persist for several weeks. There is a small risk to your life with every anaesthetic performed; these risks are, however, extremely small. There is a large number of very rare complications that may occur with even the most routine of procedures and you should always have a frank and open discussion about these with your anaesthetist.

If you or anyone in your family has had a problem with an anaesthetic, you must discuss this with the anaesthetist. If you have any worries or if you have any side-effects after your operation, please inform a member of the nursing staff who can refer you to an anaesthetist.

How long am I going to stay in hospital?

One of the main reasons for staying on in hospital is to control post-operative pain. You may go home as soon as the specialist is satisfied and you are comfortable enough, sooner for minor operations than for major operations.

You will be given painkillers to take home. Do not drive a motor vehicle, operate dangerous equipment, use any alcohol or make any important decisions for 24 hours after surgery.

Pain relief after your back operation

There are various forms of pain relief after surgery. Depending on your operation and individual circumstances, the anaesthetist may recommend one particular method of pain relief for you.

My Spine - Lumbar

Am I going to have a lot of pain afterwards?

Certain back operations are known to cause a fair amount of pain. There are three options available after these operations: intramuscular or intravenous painkillers and oral tablets for less severe pain.

How often will I need painkillers?

The anaesthetist will prescribe painkillers to be taken orally, or intramuscular injections. As soon as you start feeling uncomfortable, you should ask the nursing staff to give you tablets or an injection.

You are in the hospital after your back operation partly to control your pain, and there is no need to have severe pain. In some cases we will use a PCA (see below), which allow you to control the amount of painkiller you receive.

Patient Controlled Analgesia (PCA)

This is a method of pain relief (usually with morphine) which allows you to control the amount of painkiller you receive.

Why is this better than the nurse or specialist controlling it?

Because patients vary enormously in how much painkiller they need. We use either an electronic PCA machine, which has a button similar to a bell, or a special PCA syringe, which has a simple lever, which is pressed.

The PCA machine (or PCA syringe) allows you control over the amount of painkiller administered. You do this by pressing the button (or lever) on the handset, if you have pain.

My Spine - Lumbar

How does it work?

As soon as you feel pain, you press the button (or the lever) on the handset. This is connected to the PCA machine (or PCA syringe) and you will hear a bleep (with the electronic PCA) to confirm that the machine is working. It will then deliver a small amount of painkiller into your drip. This acts quickly and also avoids the need for painful injections.

Does the machine always give painkiller when I press the lever?

No. It only gives painkiller every few minutes (usually seven), however many times you press the button. This is to ensure that one dose has had time to take effect before another dose is given and to avoid complications such as suppression of your breathing.

Can I have an overdose of the painkiller?

PCA is generally very safe and can provide good pain relief, which is beneficial to your recovery. You will be regularly observed while you are on the PCA. It is important that only you (not relatives or friends) press the button (or lever) and only for pain from your operation site.

Will I get addicted?

No. Addiction does not happen when you are taking painkillers for a few days to treat pain from an operation, no matter how much you need.

How often should I press the lever?

You need to press the lever as often as you require to keep yourself comfortable. You should use as much painkiller as necessary to allow you to move around comfortably, take a deep breath and cough (this is important to clear secretions from your lungs). There is no need to refrain from using the PCA analgesia, as it is completely safe.

My Spine - Lumbar

Are there any side-effects to PCA?

Side-effects are sometimes encountered. It is normal to feel drowsy, however, if this is excessive you may need to be treated for it.

It is not uncommon to experience some nausea or even vomiting after having had an operation and there are many reasons for this. If you experience nausea, please tell a member of staff and an injection can be administered to treat this. If nausea is an ongoing problem then further changes can be made to treat it.

Itchiness is a common complication of PCA. Often this is only mild, but it can be treated with medication or altering the analgesic medication.

Modern anaesthesia is safe, efficient and usually associated with much less discomfort and side-effects than used to be the case. The most important thing to do is to follow your specialist's orders and convey as much information to your anaesthetist about yourself and any illnesses as you can.

CHAPTER 12



YOUR BACK OPERATION

You have agreed to surgery for your back problem. The extent, complications and outcomes have been addressed by your specialist.

The following information will be helpful in preparing for your surgical procedure.

Pre-operative information

Have you informed your specialist of any other conditions and medications including dosages that you are taking? If not, please do and do not forget to have this information at pre-admission and when you are seen by the anaesthetist.

Please note that the use of blood-thinning medication is dangerous if not stopped in time before surgery due to the decreased clotting that blood-thinning medication causes. This can lead to uncontrollable bleeding during surgery. It is important to stop taking aspirin at least ten days prior to surgery. If you are taking Warfarin, this should be stopped according to instructions from your specialist or anaesthetist. If you are taking other chronic medication it is important that you check with your specialist whether you should be taking these on the morning of surgery or not.

Please notify the staff if you have had any cardiac surgery, have a pace maker, are a diabetic, have allergies or previous unnatural reactions to medications or suffer from any infective diseases.

My Spine - Lumbar

Make sure that you understand when exactly you should stop eating and plan your trip to the hospital so that you do not have to rush to the hospital on the day of admission. Wear comfortable clothes and slip-on shoes and pack sleepwear and toiletries. Leave valuables at home, but your hearing apparatus, spectacles and dentures should be taken along.

The operation

You will be allocated a time slot on the theatre list and this is usually an indication of what time you can expect to go to theatre. There are several practical and technical reasons why your operation time slot may be changed. Sometimes an emergency case will cause a long delay and your operation might even have to be cancelled. This is, however, not the norm.

At some stage following your admission, the nursing staff will notify you when it is time for you to go to theatre. You will be taken to theatre on your bed and will normally wait for a short while in a waiting area. You will then be moved into the theatre. The anaesthetist will put up a drip to allow the anaesthetic agents to be administered. It is typical that the medication will cause a burning feeling in your arm as you are put to sleep. This is normal and will quickly pass.

All vital signs (heart rate, blood pressure, breathing, oxygen concentration of the blood and many more parameters) will be measured for the full duration of your operation. The number of parameters that are monitored is dependent on your physical condition and whether you have certain risk factors.

Please see the specific chapters on procedures and operations for technical data about the operation that your specialist is suggesting. It may be necessary to have a blood transfusion during your operation. Whether a blood transfusion is administered depends on the amount of blood-loss during the operation as well as your physical condition and age.

My Spine - Lumbar

If a blood transfusion is considered, a sample of your blood will be taken and sent away to the blood transfusion service where rigorous tests will be performed to ensure that the correct type of blood is issued.

There may be technology available to salvage your own blood during the procedure and to re-transfuse it via a drip into your veins. It is also possible in elective surgery to donate your own blood some time in advance if it is thought that the procedure will cause large amounts of blood-loss.

A drainage pipe will usually be placed in the wound at the end of the operation and connected to a reservoir and the wound will be closed. This will allow all excess blood to drain away. Following the operation, you will be taken to the recovery room to recover from your anaesthetic.

In the recovery room you may have an oxygen mask on your face. Do not be alarmed and try and be as relaxed as possible. You will have a catheter in your bladder and this may make the bladder feel uncomfortable. Do not worry, your bladder should not be full and urine will flow automatically into a drainage bag.

Following your stay in the recovery room you will be moved to the ward and the nursing staff will monitor your recovery, assist with your rehabilitation and administer analgesia for any discomfort that you may experience.

What are the possible complications of the operation?

We do not expect to encounter any complications. Spinal surgery is, however, not risk free and you have to be sure that you understand the more well-known complications. It is important to realise that it is impossible to fully describe all possible complications of surgery. The following are the most well-recognised complications.

Risk: *There is a risk that the pain, pins and needles or weakness that you currently experience, might not improve immediately following surgery, or in rare cases, never.*

My Spine - Lumbar

Explanation: If the nerve compression had been too severe or too prolonged, it may be irreversible. Nerves can be unforgiving and may lose part of, or complete function. In some cases these symptoms can take some time to improve.

Risk: *There is a chance of wound infection that might require antibiotic treatment and in some cases a second operation. In very rare cases, infection might spread and become so severe that it may cause death.*

Explanation: Even with the most advanced modern antiseptic techniques, infection can occur. This is the case particularly in patients who have depressed immunity as is seen in diabetics, smokers, HIV positive patients and patients on long term steroid use and any other immunosuppressant drugs.

Risk: *There is always a risk of bleeding in any surgery. This may happen during or following surgery. This may lead to compression or damage to nerves in the period directly following the operation. Severe bleeding during the operation might require a blood transfusion, but this is rare. In extreme cases it may lead to death. Bleeding may also cause a swelling under the skin and if very large and painful, or compressing vital structures, it may be necessary to drain this blood clot with a minor surgical procedure.*

Explanation: During surgery, all the bleeding arteries are closed with an electric cautery. These blood vessels may, however, open up again and start bleeding. If the blood clot grows large it may compress important structures like nerves and can lead to nerve dysfunction. The specialist will inspect the wound carefully before the wound is closed and even the smallest bleeding point is stopped.

Risk: *During surgery there is a risk of damage to the nerves or spinal cord which can lead to weakness or paralysis. It can also lead to loss of sensation and other nerve controlled functions including the bowel, sexual and bladder function. This may be temporary or permanent. This is a very rare complication.*

My Spine - Lumbar

Explanation: The spinal cord and the nerve roots that are attached to them are directly in the area where the surgery is performed. Direct pressure on these structures by surgical instruments or blood clots can cause damage. Sharp instruments can damage nerves permanently. You may need an MRI scan (see the chapter *Tests and Scans*) if your specialist deems it necessary to assess significant complications.

Risk: *There is a risk that the bony fusion which is part of some of the spinal procedures will not grow, leading to follow-up surgery to support the fusion. If you are a smoker or use steroids or Warfarin, there is a definite risk that the bony fusion will not grow. It is imperative that you stop smoking before a spinal fusion operation.*

Explanation: The aim of some of the operations is to remove the disc between the two vertebral bodies and to induce a fusion to form between the two vertebrae. This is facilitated by placing bone between the two vertebrae. In smokers and patients taking certain medications such as Warfarin, steroids, anti-inflammatory drugs and certain other drugs, the bone does not grow as well and causes non-union of the fusion. Make sure that you take only the medication prescribed by your specialist following your procedure.

Risk: *There is a risk that you might develop a blood clot in the veins of your legs, called a deep venous thrombosis (DVT). This thrombosis can spread to the lungs and heart and can cause death.*

Explanation: This is a risk in all lengthy operations and prolonged bedrest. This is because of sluggish flow of blood in the veins. The risk can be lowered by applying compressive stockings as well as foot pumps that keep the blood flowing. It is also important that you should get up and move around as soon as you are allowed. Passive leg exercises while in bed should be explained to you by your physiotherapist.

Risk: *Although it is extremely rare, there is a risk that you may die during surgery because of an anaesthetic complication. Due to modern techniques this risk is now less than 1/10 000.*

My Spine - Lumbar

Explanation: Unexpected events can take place during or after operations. This can include reactions to medications, a heart attack, a stroke, kidney failure, lung failure, blood clots in the legs or severe infections. Each one of these conditions will require further treatment and rarely these are serious enough to lead to death.

Risk: *It is possible that the instrumentation that is used during an operation may dislodge, move or fail.*

Explanation: Instrumentation and prosthesis used in spinal surgery are foreign bodies and are used to correct the alignment of the spine and to allow a bony fusion to occur. In some cases this instrumentation may fail (break), move or dislodge and can compress sensitive tissue, necessitating removal or replacement of this instrumentation.

Risk: *It is possible that fusing a segment of the lumbar spine, may lead to accelerated wear and tear at the adjacent segments of the spine leading to further spinal surgery.*

Explanation: The biomechanical properties of the segment of the spine that is being fused changes and becomes less mobile. This may cause a lever action on the adjacent segments that is thought to accelerate the wear and tear at the adjacent segments. In an attempt to overcome this, it is possible in selected cases to remove the disc that is causing nerve compression and replace it with an artificial disc rather than performing a fusion (see the chapter *Lumbar Total Disc Arthroplasty*).

Risk: *It is possible that a major blood vessel may be damaged during surgery.*

Explanation: In anterior (from the front) surgical approaches to lumbar surgery, some of the major blood vessels may be damaged. These complications rates vary according to the type of surgery and many technical factors. This may be a very serious complication and may even lead to the death of the patient.

My Spine - Lumbar

Discharge

You would normally be discharged between two days and one week after surgery, depending on the type of surgery. Staff at the hospital can assist in taking care of your follow-up consultation, analgesics to take home, sick leave-certificate and wound care provisions in the post-operative period.

Rehabilitation

It is incredibly important to get a lot of rest and exercise following your surgery. Do not try to rush back to work. It is important to walk for exercise and also exercise in conjunction with the guidelines from your physiotherapist. You may perform activities only as prescribed by your specialist. You should refrain from exercises that involve impact for at least three months. This would include jogging, mountain biking and equestrian pursuits.

Follow-up

Routinely you will receive a date for your follow-up appointment with your specialist. This may vary from anything between two and six weeks, but you will be seen earlier if there are any complications.

CHAPTER 13



LUMBAR NERVE ROOT BLOCK

(This is the section that explains the detail of the operation or procedure above and should be read in conjunction with the the chapter *Your Back Operation*).

A lumbar nerve root block is performed for pain that is caused by an irritated nerve root. The aim of the procedure is to reduce the inflammation of the nerve root and also to block the pain impulse from travelling up the nerve to the brain. This will then bring partial or complete (but usually temporary) relief of the pain.

The reason why your specialist performs this procedure is to first of all correctly diagnose whether this nerve root is causing the pain that is felt in the leg and secondly to bring temporary relief from the pain. It is the usual practice to use a mixture of long-acting local anaesthetic and steroids when injecting around the nerve root.

The local anaesthetic solution brings instantaneous relief of the pain, if it is indeed the nerve root that is responsible for the pain and serves as a confirmation to your specialist that this is indeed the pathological level. The steroids reduce the inflammation and will provide longer-acting pain relief. This pain relief may be permanent in cases where the nerve compression is of a temporary nature. The nerve root block facilitates the normal recovery process of the nerve in cases where the compression is a temporary feature. This may be the case in a disc herniation.

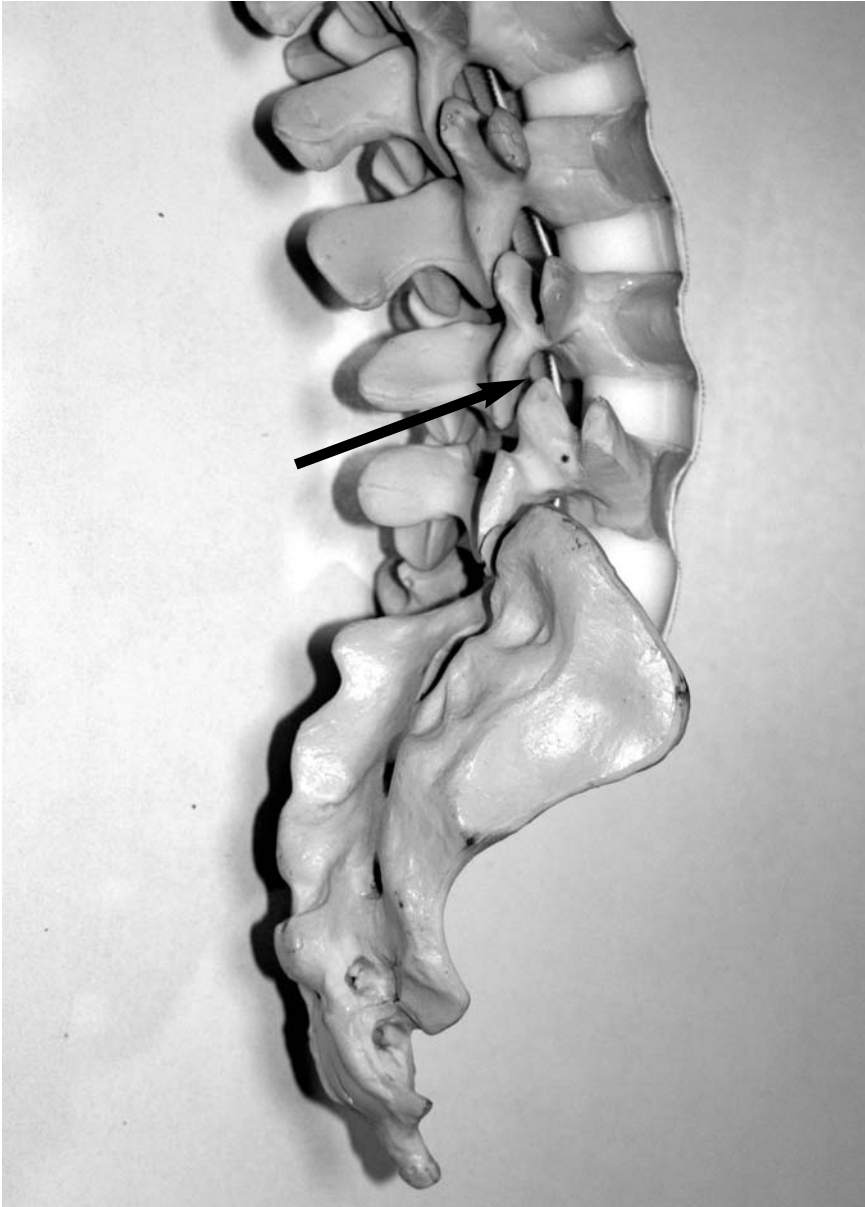


Figure 13.1

This photo demonstrates a nerve root block. The arrow demonstrates the direction that the needle would be inserted to reach the foramen through which the nerve root runs. When having this procedure performed, you would be lying on your stomach and the nerve block would be done from the back.

My Spine - Lumbar

In other cases where the foramen through which the nerve runs (see the chapter *Anatomy of the Spine*), is permanently obstructed by a disc fragment or because of a bony narrowing, the relief will only be temporary. The block will, however, serve to determine the level at which an operation should take place.

When undergoing this procedure, you will be lying on your stomach on bolsters or pillows. Your specialist will use an X-ray machine to guide the needle that is used to do the procedure with. The needle is placed directly into the foramen and a mixture of steroids and local anaesthetic is injected into the foramen and around the nerve. This procedure can also be performed on an out-patient basis under CT guidance by a radiologist.

Ward care

You may sometimes have a bit of discomfort directly after the procedure, but this will clear up very soon. You will be allowed to move around freely following your procedure.

Discharge

This procedure is usually performed as a day procedure and you will be allowed to go home soon after your procedure.

Rehabilitation

It is incredibly important to get a lot of rest and exercise following your procedure. It is frequently useful to supplement your treatment with physiotherapy and local treatment such as massage therapy and chiropractic treatment. The nerve root block is both a test and a treatment. Neural stretch exercises are important to allow the nerve to mobilise freely in the foramen. Your physiotherapist will assist you with these.

My Spine - Lumbar

Follow-up

Routinely you will receive a date for your follow-up appointment with your specialist. This may vary from anything between two and six weeks, but you will be seen earlier if there are any complications. It is important to realise that you will have to protect your back for the rest of your life and apply good back habits (see the chapter *Everyday Life*).

CHAPTER 14



CAUDAL/SACRAL BLOCK

(This is the section that explains the detail of the operation or procedure above and should be read in conjunction with the chapter *Your Back Operation*).

A caudal/sacral block is performed for pain that is caused by inflammation and irritation in the spinal canal. The aim of the procedure is to reduce the inflammation inside the spinal canal. This will then bring about partial or complete (but usually temporary) relief of the pain, spasm and referred pain that this inflammation around the nerves can cause.

The reason why your specialist performs this procedure and not a more invasive procedure, is because he or she is trying to be as conservative as possible in treating your symptoms.

When undergoing this procedure, you will be lying on your stomach on bolsters or pillows. Your specialist will use an X-ray machine to guide the needle that is used to do the procedure with. The needle is placed directly into the sacral hiatus – this is at the bottom end of the spine – and a mixture of steroids and local anaesthetic is injected into the sacral hiatus (also called caudal hiatus). This procedure is performed with local anaesthetic and sometimes with sedation.

This procedure can also be performed on an out-patient basis under CT guidance by a radiologist.

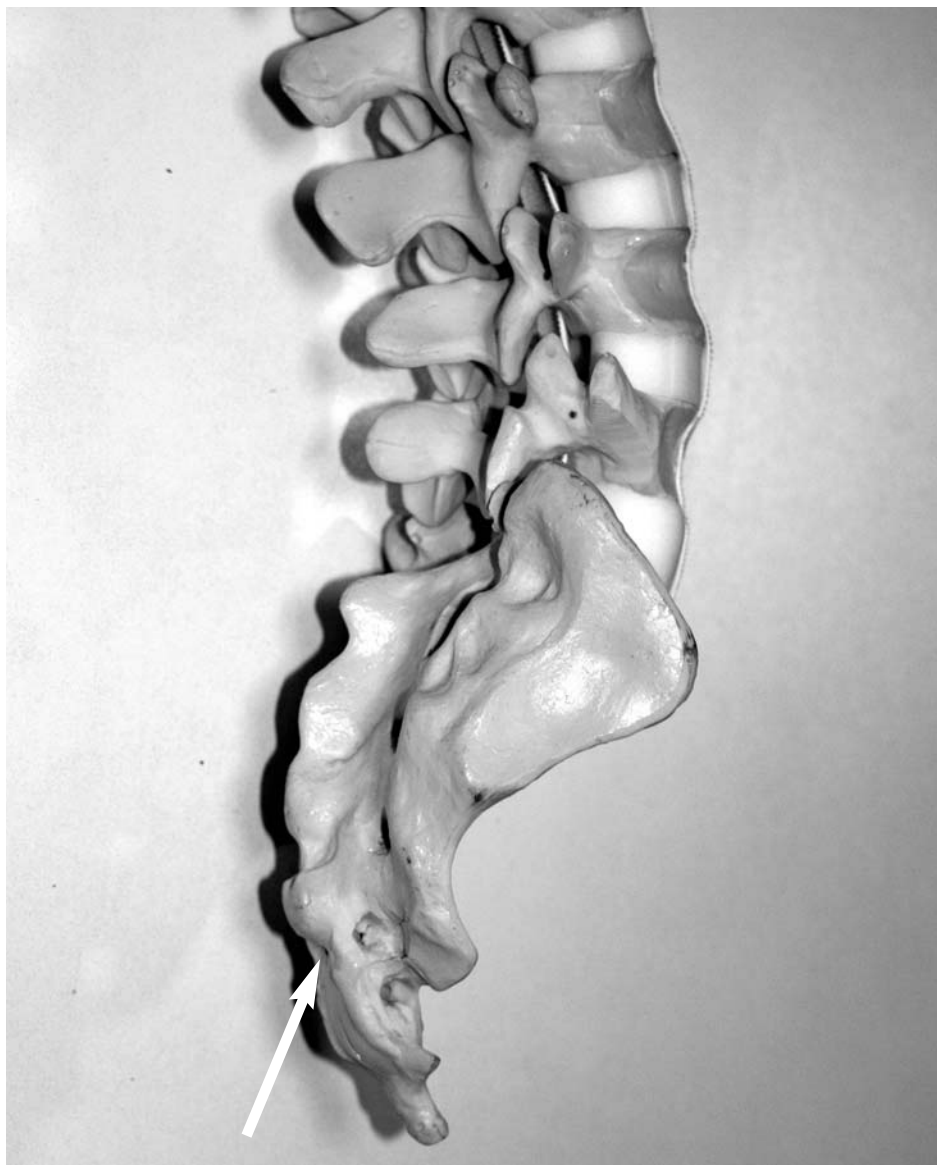


Figure 14.1

This photo demonstrates the angle that the needle is inserted into the sacral hiatus. This is the bony opening seen from the side, directly in front of the tip of the arrow. When undergoing this procedure, you will be lying on your stomach and your specialist will insert the needle quite close to, or into, the buttock skin fold, depending on your anatomy.

My Spine - Lumbar

Ward care

You may sometimes have a bit of discomfort directly after the procedure, but this will clear up very soon. You will be allowed to move around freely following your procedure.

Discharge

This procedure is usually performed as a day procedure.

Rehabilitation

It is incredibly important to get a lot of rest and exercise following your procedure. It is frequently useful to supplement your treatment with physiotherapy and local treatment such as massage therapy and chiropractic treatment.

Follow-up

Routinely you will receive a date for your follow-up appointment with your specialist. This may vary from anything between two and six weeks, but you will be seen earlier if there are any complications. It is important to realise that you will have to protect your back for the rest of your life and apply good back habits (see the chapter *Everyday Life*). This procedure is part of conservative management, bear in mind that it may fail and further treatment including surgery may be required.

CHAPTER 15



LUMBAR FACET BLOCK (FB)

(This is the section that explains the detail of the operation or procedure above and should be read in conjunction with the chapter *Your Back Operation*).

A lumbar FB is performed for pain that is caused by damaged facet joints. The aim of the procedure is to reduce the inflammation inside the facet joint. This will then bring partial or complete (but usually temporary) relief of the pain, spasm and referred pain that these damaged facet joints can cause.

The reason why your specialist performs this procedure and not a more invasive operation is because he or she is trying to be as conservative as possible in treating your condition. The aim is to treat your symptoms without resorting to a more invasive operation.

When undergoing this procedure, you will be lying on your stomach on bolsters or pillows. Your specialist will use an X-ray machine to guide the needle that is used to do the procedure with. The needle is placed directly into the facet joint and a mixture of steroids and local anaesthetic is injected into and around the joint. Your specialist may also inject the same solution around the nerve that supplies the facet joint.

This procedure can be performed with local anaesthesia and sometimes with sedation.

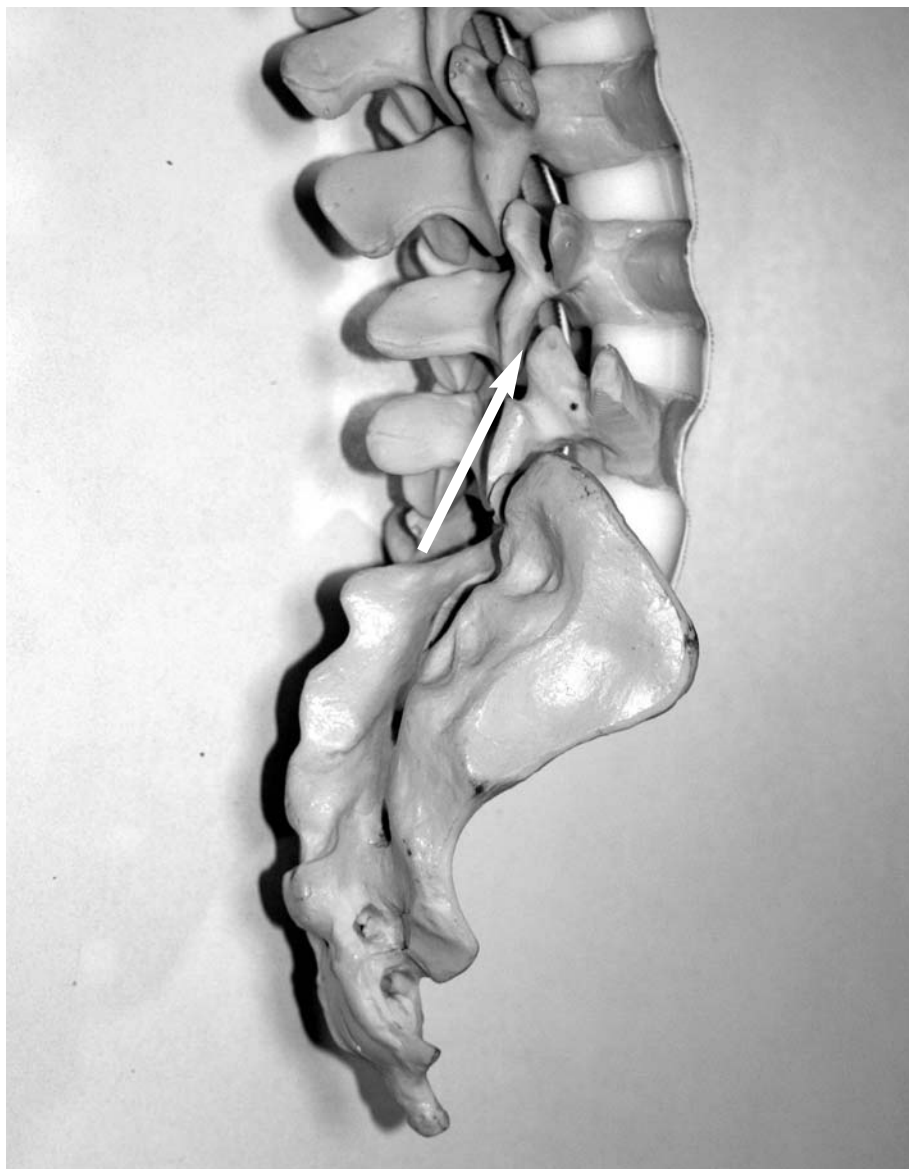


Figure 15.1

This photo illustrates the lumbar spine. The arrow indicates the direction of the needle during the block and the tip of the arrow is in the facet joint between the fourth and fifth lumbar vertebrae.

My Spine - Lumbar

This procedure may also be performed on an out-patient basis under CT guidance by a radiologist.

Ward care

You may sometimes have a bit of discomfort directly after the procedure, but this will clear up very soon. You will be allowed to move around freely following your procedure.

Discharge

This procedure is usually performed as a day procedure.

Rehabilitation

It is incredibly important to get a lot of rest and exercise following your procedure. It is frequently useful to supplement your treatment with physiotherapy and local treatment such as massage therapy and chiropractic treatment.

Follow-up

Routinely you will receive a date for your follow-up appointment with your specialist. This may vary from anything between two and six weeks, but you will be seen earlier if there are any complications. It is important to realise that you will have to protect your back for the rest of your life and apply good back habits (see the chapter *Everyday Life*). This procedure is part of conservative management, bear in mind that it may fail and further treatment including surgery may be required.

CHAPTER 16



LUMBAR RADIOFREQUENCY RHIZOTOMY (RFR)

(This is the section that explains the detail of the operation or procedure above and should be read in conjunction with the chapter *Your Back Operation*).

A lumbar RFR procedure is performed for pain that is caused by damaged facet joints. The aim of the operation is to temporarily paralyse the very small nerves that supply the facet joint of pain sensation. This will then bring partial or complete (but usually temporary) relief of the pain, spasm and referred pain that these damaged facet joints can cause.

The reason why your specialist performs this procedure and not a more invasive operation is because he or she is trying to be as conservative as possible in treating your condition. The aim is to treat your symptoms without resorting to a more invasive operation.

When undergoing this procedure, you will be lying on your stomach on bolsters or pillows. Your specialist will use an X-ray machine to guide the needles that are used to do the procedure with. A very thin electrode is inserted through the needles and the nerve that supplies your facet joint is stunned or damaged by radiofrequency generated by a radiofrequency generator.

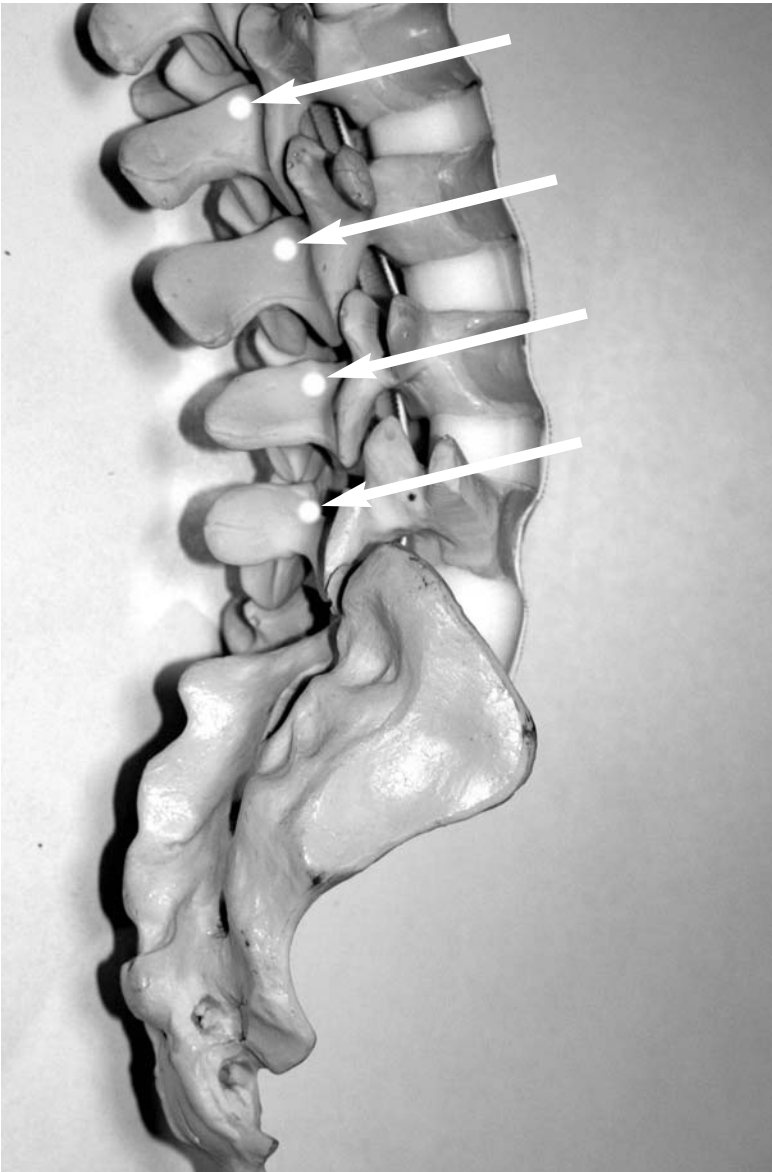


Figure 16.1

This photo demonstrates the anatomical position of the nerve that is being targeted in a radiofrequency rhizotomy. The nerve curls into the facet joint from here and supplies the joint of pain sensation. The aim is to inactivate this nerve so that the pain signal that originates in the joint does not travel to the brain, and relief of symptoms is achieved.

My Spine - Lumbar

This procedure is frequently performed following a successful facet block.

These are not majorly important nerves and it is not dangerous to inactivate them with radiofrequency pulses. When inactivated, these nerves cannot conduct pain sensation from the joint to the brain. This means that the pain sensation from the facet joints decrease or clear up completely. This is, however, a temporary effect and the treatment has to be repeated when the pain returns.

Some of the effects are immediate, but it is quite normal that you may experience pain for about two to three weeks after the procedure. Maximum pain relief is usually experienced at about six weeks after the procedure. The effects can last for a year or more.

Not all people have relief from this procedure and the success rate is quoted as being between 40% and 75%.

Ward care

You may sometimes have a bit of discomfort directly after the procedure, but this will clear up very soon. You will be allowed to move around freely after your procedure.

Discharge

This procedure is usually performed as a day procedure, although in some cases patients might need to stay in hospital overnight.

Rehabilitation

It is incredibly important to get a lot of rest and exercise following your procedure. It is frequently useful to supplement your treatment with physiotherapy and local treatment such as massage therapy and chiropractic treatment.

Follow-up

Routinely you will receive a date for your follow-up appointment with your specialist. This may vary from anything between two and six weeks, but you will be seen earlier if there are any complications. It is important to realise that you will have to protect your back for the rest of your life and apply good back habits (see the chapter *Everyday Life*). This procedure is part of conservative management, bear in mind that it may fail and further treatment including surgery may be required.

CHAPTER 17



LUMBAR NUCLEOPLASTY

(This is the section that explains the detail of the operation or procedure above and should be read in conjunction with the chapter *Your Back Operation*).

A lumbar Nucleoplasty is performed for pain that is caused by damaged inter-vertebral discs. The aim of the procedure is to reduce the pressure on the small nerves that are found in the annulus fibrosus. This is done by shrinking the nucleus pulposus (see the chapter *Anatomy of the Spine*). The modality used for this is similar to radiofrequency rhizotomy, but a device is used which utilises coblation technology to dissolve tissue without damage to nearby normal structures.

The reason why your specialist performs this procedure and not a more invasive procedure is because he or she is trying to be as conservative as possible in treating your condition. The aim is to treat your symptoms without resorting to a more invasive operation.

When undergoing this procedure, you will be lying on your stomach on bolsters or pillows. Your specialist will use an X-ray machine to guide the needle that is used to do the procedure with. A patented plasma device is then inserted through the needle into the disc, whereby excess tissue is removed. Removing some of the tissue from the centre of the disc causes a reduction in intra-discal pressure, which in turn eases symptoms.

My Spine - Lumbar



Images used with permission from ArthroCare

Figure 17.1

These illustrations demonstrate a Nucleoplasty. The needle is inserted into the disc under fluoroscopic (X-ray) guidance and close to the area where the disc is bulging.

Coblation therapy enables tissue to be removed quickly and efficiently without damaging nearby normal structures. The picture second from the top demonstrates how the tissue is actually “dissolved”.

My Spine - Lumbar

Ward care

You may sometimes have a bit of discomfort directly after the procedure, but this will clear up very soon. You will be allowed to move around freely following your procedure.

Discharge

This procedure is usually performed as a day procedure, although in some cases patients might need to stay in hospital overnight.

Rehabilitation

It is incredibly important to get a lot of rest and exercise following your procedure. It is frequently useful to supplement your treatment with physiotherapy and local treatment such as massage therapy and chiropractic treatment.

Follow-up

Routinely you will receive a date for your follow-up appointment with your specialist. This may vary from anything between two and six weeks, but you will be seen earlier if there are any complications. It is important to realise that you will have to protect your back for the rest of your life and apply good back habits (see the chapter *Everyday Life*). It is also important to appreciate that the efficacy and longevity of this treatment is still under investigation.

CHAPTER 18



LUMBAR MICRODISCECTOMY

(This is the section that explains the detail of the operation or procedure above and should be read in conjunction with the chapter *Your Back Operation*).

A lumbar microdiscectomy is performed for a slipped (herniated or prolapsed) disc. The aim of the operation is to remove the bit of the nucleus pulposus (see the chapters *Your Back Operation* and *Anatomy of the Spine*) that has herniated through the annulus fibrosus. It is important to realise that the remainder of the nucleus pulposus will remain behind and can eventually also herniate and cause repeated symptoms. This is one of the complications following microdiscectomy and the recurrence may be as high as 20%-50%.

The reason why your specialist performs this procedure and not a more invasive operation is because he or she is trying to be as conservative as possible in doing your surgery. Hopefully these damaged discs might heal in time and not result into a more invasive operation. Some progress in the less invasive surgery front has been made by laser surgery, endoscopic surgery and percutaneous Nucleoplasty.

When undergoing this operation, you will be lying on your stomach on bolsters or pillows. Your specialist will make a small cut along your spinous processes. This cut can vary from two or three centimetres to a slightly larger cut. Sometimes the cut is performed to the side of the spine to allow for an approach from the side through the muscles.

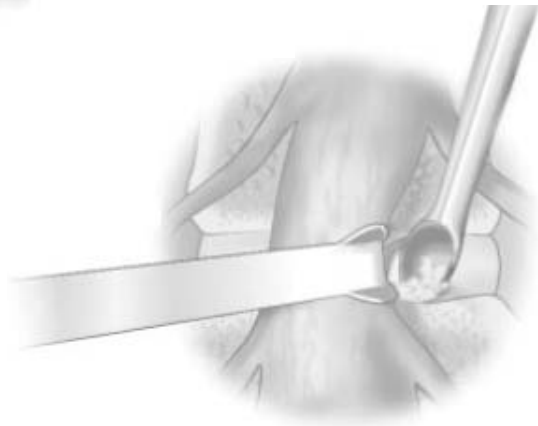
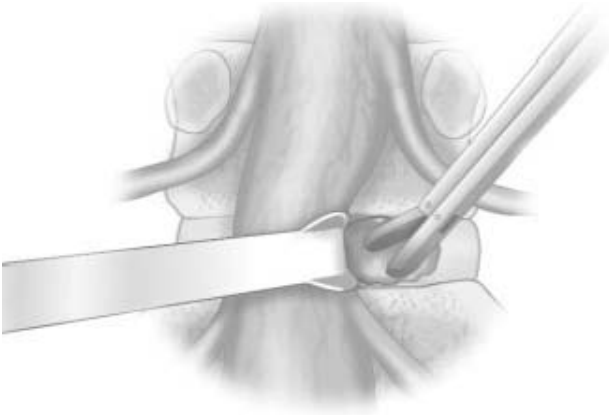
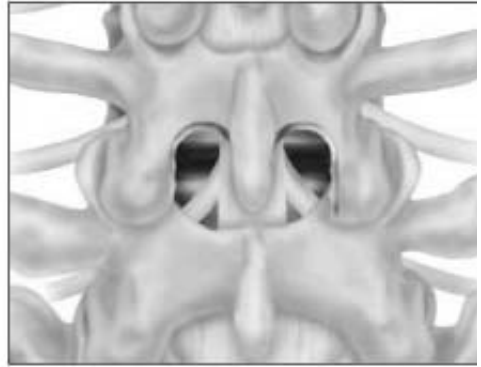


Image used with permission from Medtronic

Figure 18.1

The top illustration demonstrates the incision that is used for a microdiscectomy. Many specialists use an incision that is only about one third as long as the incision on the illustration. The length of the cut is of little consequence. Microdiscectomy is a relatively minor invasive procedure with the minimum amount of tissue damage.

The illustration on the opposite page (top left) demonstrates the area through which the spinal canal is entered (circles), by taking a small amount of the lamina (see the chapter Anatomy of the Spine) and removing the ligament inside the spinal canal (ligamentum flavum). The picture on the opposite page (top right) reveals the nerves after the bit of the lamina and the ligamentum flavum has been removed. This image demonstrates the approach when both sides are done at the same time. Only one side would frequently be performed, especially if the disc herniation is only towards one side. The bottom two pictures (opposite page) demonstrate how the nerves are retracted to one side and the offending part of the disc removed.



Images used with permission from Medtronic

My Spine - Lumbar

The length of the incision depends on various factors such as patient size, the number of spinal levels involved and your specialist's preference. The length of the incision is actually of little consequence with regard to the success of the operation. The soft tissue and muscles that are attached to the vertebrae are stripped away by a combination of electrosurgical cautery (a blade that cuts with an electrical current) and dissecting instruments. A small amount of bone as big as the nail on your little finger or slightly more is removed along with some ligaments. This allows direct access to the nerves. They are retracted and the disc fragment is removed. Thereafter the wound is stitched up.

Ward care

You would be expected to get out of bed quite soon and usually on the first day following surgery or even on the same day. You may usually walk around as much as you want, but you should take care and not sit for too long or on a seat that is very low. This is to prevent you from having a repeat disc prolapse (herniation). Most specialists recommend a duration of 30 minutes or less of sitting at a time. It is best to sit on a chair that is at the height of a barstool.

Discharge

You would normally be discharged at about one to three days after surgery, depending on the degree of pain and disability you are experiencing and on the absence of any complicating wound factors or concern about your general health at the time.

The hospital staff will assist you in obtaining your follow-up consultation bookings, the prescribed analgesics to take home, the sick leave-certificate to be provided by your doctor and the instructions regarding wound care provisions in the post-operative period.

My Spine - Lumbar

Rehabilitation

It is incredibly important to get a lot of rest and exercise following your surgery. Do not try to rush back to work. It is important to walk for exercise and also exercise in conjunction with the guidelines from your physiotherapist. You may perform activities only as prescribed by your specialist.

You should refrain from exercises that involve impact for at least three months. This would include jogging, mountain biking and equestrian pursuits.

Follow-up

Routinely you will receive a date for your follow-up appointment with your specialist. This may vary from anything between two and six weeks, but you will be seen earlier if there are any complications. It is important to realise that you will have to protect your back for the rest of your life and apply good back habits (see the chapter *Everyday Life*).

CHAPTER 19



LUMBAR DECOMPRESSION

(LAMINECTOMY AND LAMINOTOMY)

(This is the section that explains the detail of the operation or procedure above and should be read in conjunction with the chapter *Your Back Operation*).

A lumbar decompression is performed for trapped nerves. The aim of the operation is to remove the compressive elements that are compressing the nerves of the spine. This may be caused by bone, ligaments or even parts of discs.

The patient usually presents with progressive pain on standing and activity which improves with rest. They will also have progressive weakness and a feeling of their legs giving way under them. This is because the compression of the nerves leads to dysfunction of these nerves.

The aim of this procedure is to remove the compression with as simple and minimally invasive an approach as possible without causing the spine to become unstable. When the lamina (see the chapter *Anatomy of the Spine*) is completely removed, it is called a laminectomy and when the lamina is only partially removed, it is called a laminotomy. If the decompression needs to be more complex, a fusion procedure might be required to stabilise the spine.

When undergoing this operation, you will be lying on your stomach on bolsters or pillows during your procedure.

My Spine - Lumbar



Image used with permission from Medtronic

Figure 19.1

This drawing demonstrates the position of the patient during the operation and the site of the surgical incision. Some specialists will operate with their patients lying on pillows on a regular operating table and some specialists will have special frames and even special spinal surgery tables for their patients to lie on during the operation. The length of the cut should be sufficient to allow the specialist to safely do the procedure. The trend currently is towards smaller, less invasive incisions. Some specialists even use an endoscope with only a very small incision to perform the surgery.

My Spine - Lumbar

Your specialist will make a small cut along your spinous processes. The length of the incision depends on various factors such as patient size, the number of spinal levels involved and your specialist's preference. The length of the incision is actually of little consequence with regard to the success of the operation.

The soft tissue and muscles that are attached to the vertebrae are then stripped away by means of a combination of electrosurgical cautery (a blade that cuts with an electrical current) and dissecting instruments. All the compressive bone, ligaments and disc fragments are then removed and the nerves probed to make sure that they are not restricted in the spinal canal and in the foramina through which they exit the spinal canal. If there are sufficient structures left to allow it, your specialist might place a spacer between the spinous processes of the adjacent vertebrae to keep the spinal canal open which allows the nerves more space. Thereafter the wound is stitched up.

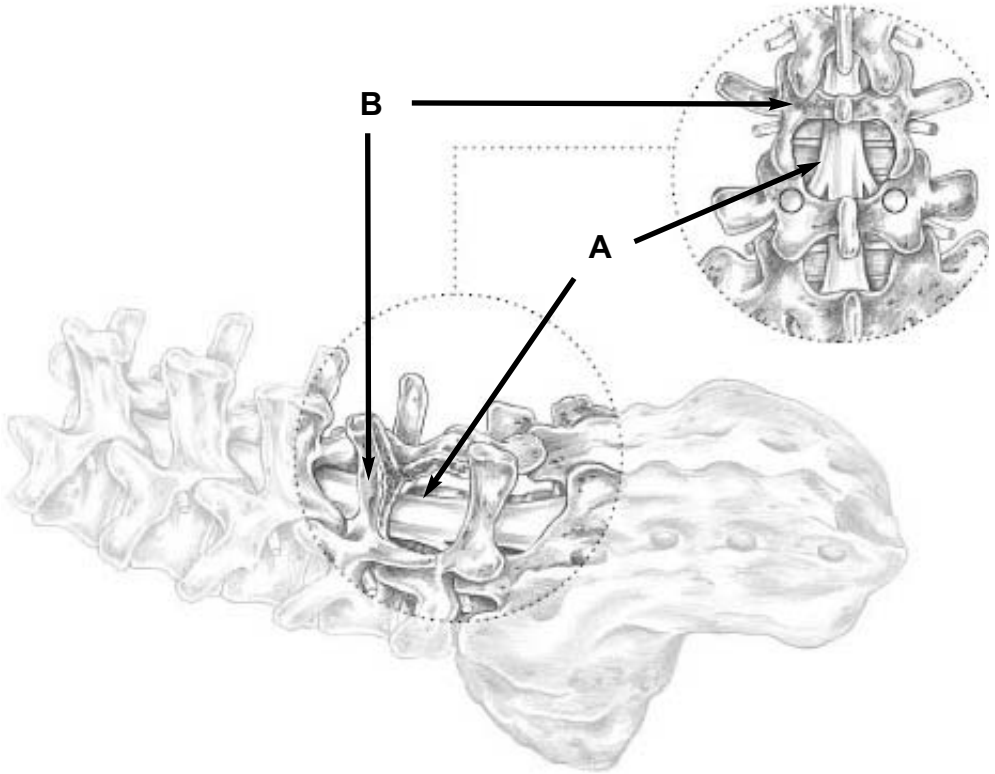
Ward care

You would be expected to get out of bed quite soon and usually on the first day following surgery. You may usually walk around as much as you want depending on the stability of your spine. Your specialist will advise you about this. You should take care and not sit for too long or on a seat that is very low. This is to prevent you from placing too much strain on your lower back. Most specialists recommend a duration of 30 minutes or less of sitting at a time.

Discharge

You would normally be discharged at about five to ten days after surgery, depending on the degree of pain and disability you are experiencing and on the absence of any complicating wound factors or concern about your general health at the time.

The hospital staff will assist you in obtaining your follow-up consultation bookings, the prescribed analgesics to take home, the sick leave-certificate to be provided by your doctor and the instructions regarding wound care provisions in the post-operative period.



Images used with permission from Medtronic

Figure 19.2

This drawing demonstrates a partial laminectomy (laminotomy) with only the top part of the lamina remaining (B). Note in the cut-out how the spinal nerves (A) are exposed by removing the lamina. A laminectomy is done to free nerves that are being compressed by ligaments, bony outgrowths and disc herniations. If the laminectomy is too generous, the facet joints can be damaged or partially removed. This may lead to instability of that vertebral segment and may require a fusion in the future.

My Spine - Lumbar

Rehabilitation

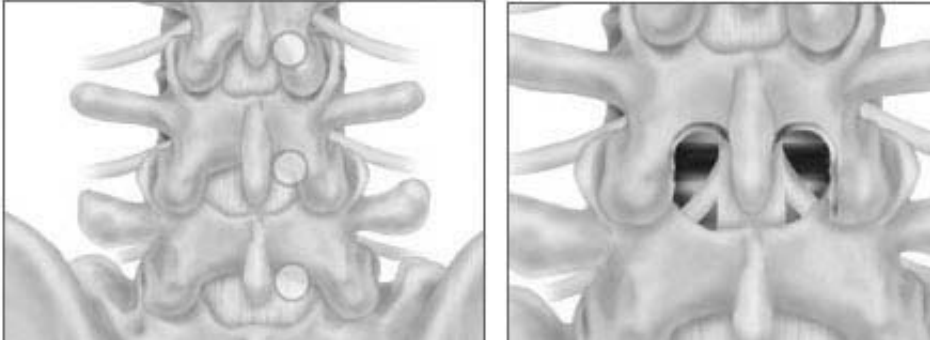
It is incredibly important to get a lot of rest and exercise following your surgery. Do not try to rush back to work. It is important to walk for exercise and also exercise in conjunction with the guidelines from your physiotherapist. You may perform activities only as prescribed by your specialist. You should refrain from exercises that involve impact for at least three months. This would include jogging, mountain biking and equestrian pursuits.

Follow-up

Routinely you will receive a date for your follow-up appointment with your specialist. This may vary from anything between two and six weeks, but you will be seen earlier if there are any complications. In cases of spinal fusion you would usually undergo an X-ray of your back a few months after the operation to evaluate the bone growth between the two vertebrae; this is covered in the chapter *Lumbar Fusion*. It is important that this bony growth takes place, otherwise the operation might have to be repeated.

It is important to realise that you will have to protect your back for the rest of your life and apply good back habits (see the chapter *Everyday Life*).

My Spine - Lumbar



Images used with permission from Medtronic

Figure 19.3

These drawings demonstrate a less invasive laminotomy. In this procedure, the amount of bone removed is much less and a window is created in the lamina through which the specialist can gain access and decompress the nerves of the spinal canal. This procedure allows the spine to remain much more stable, than when a full laminectomy is performed, since the spinous processes and their associated ligaments remain intact.

CHAPTER 20



LUMBAR FUSION

(PLIF, TLIF, POSTERO LATERAL FUSION AND INTERSPINOUS
DEVICES)

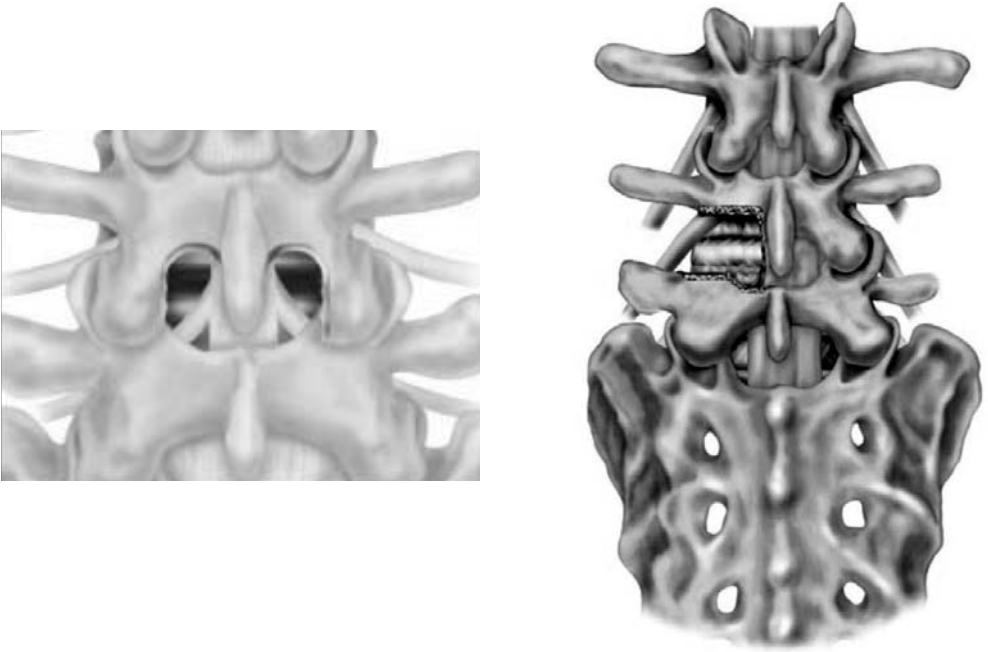
(This is the section that explains the detail of the operation or procedure above and should be read in conjunction with the chapter *Your Back Operation*).

Sometimes it is necessary to perform a lumbar spinal fusion. This is done to create a bony union between two or more lumbar vertebrae, in order to stabilise the spine. It is usually done for instability which may arise from an injury or from wear and tear changes. It may also be secondary to extensive decompressive surgery or may be made necessary by a gradual dislocation from an inborn abnormality. Other causes are infection, tumour or a previous fusion that has failed to unite.

A spinal fusion operation is also sometimes performed following lumbar disc removal, nerve decompression, removal of vertebral bodies or for the correction of spinal deformity.

In order to improve the chances of successful bony union, internal supports and pedicle screws are often used (see the chapter *Anatomy of the Spine*). Internal devices may consist of blocks of bone, plastic or metal, which are introduced between the vertebrae. Instrumentation consists usually of pedicle screws with rigid linkages. These pedicle screws pass through the pedicles of the vertebrae and achieve a strong hold on the vertebrae. They are then interconnected with a rod.

My Spine - Lumbar



Images used with permission from Medtronic

Figure 20.1

These drawings illustrate the different bony openings that are created during two different interbody fusion procedures. The left-hand picture demonstrates the partial removal of the laminae on both sides. This approach, or bony opening, is used in a PLIF (posterior lumbar interbody fusion).

The drawing on the right demonstrates the approach for a TLIF (transforaminal lumbar interbody fusion). Note how, in this case, the facet joint on the left has been removed. Both the lamina and the joint are removed to get to the foramen through which the nerve runs.

In both cases as much as possible of the disc is removed and replaced by spacers that are filled with bone. It has two functions, the first is to carry the weight transmitted through the spine and the second function is to allow the two vertebrae to grow together (fuse).

My Spine - Lumbar

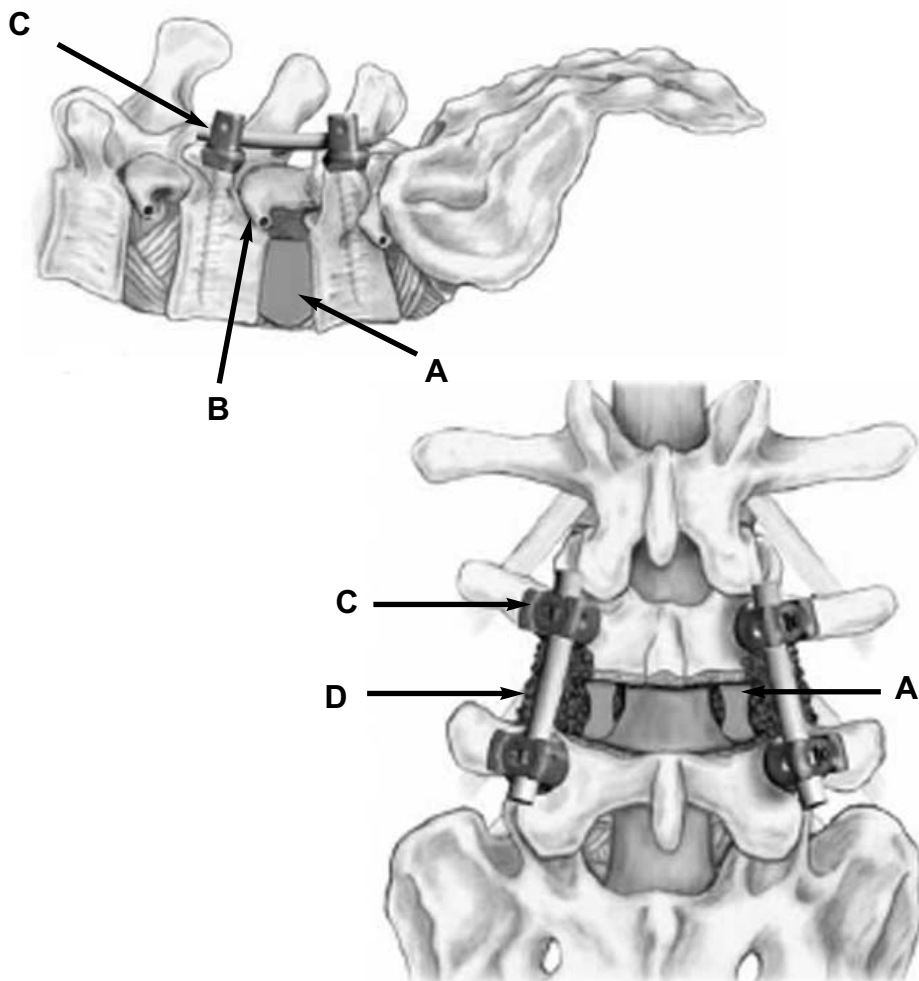
The proper fusion is achieved through bone growth. The bone is placed between and around certain segments of the adjacent vertebrae, which then grow together. These may be the spinous processes of the vertebrae (inter-spinous fusion), the laminae of the vertebrae (posterior fusion), the transverse processes (inter-transverse postero-lateral fusion) or between the vertebral bodies themselves (interbody fusion). Of these techniques the inter-transverse postero-lateral fusion and the interbody fusion are the most common forms of posterior fusions performed.

Many of the interspinous devices do not constitute a proper fusion as the aim is not bony growth, but rather to keep the distance between the spinous processes and allow for the spinal canal to be capacious, thus reducing nerve compression due to a narrowing of the canal.

The interbody fusions are divided according to the method of introducing the bone between the vertebral bodies into posterior lumbar interbody fusion (PLIF) and transforaminal lumbar interbody fusion (TLIF). The traditional posterior lumbar interbody fusion (PLIF) places bone blocks or cages between the vertebrae from both sides, which necessitates operating from both sides of the spinal canal. The more recent operation of a TLIF places a single spacer well forward between the vertebrae and this is introduced from one side only. In both cases the remaining space between the vertebrae is then filled with bone.

These operations often need bone to be harvested from the iliac crest (the hip) of the patient through usually a separate incision, because at this stage the use of the patient's own bone for fusion is still regarded as the gold standard. Sometimes the decompression operation yields enough excised bone that can be collected and prepared to be used for the bone graft. Allograft from a bone bank or synthetic material (inducing bone growth) is also used by some specialists for this purpose.

The main aim of the fusion operation is to achieve bony fusion. If this is not achieved, then the operation has failed and if the patient continues to have symptoms, another operation might have to be performed in the future. Bone growth is variable and depends on many factors. These vary from person to person.



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Figure 20.2

These drawings illustrate a PLIF. Note how the cages (A) have been placed in the cleared disc space. The picture on the left demonstrates what it looks like if you could see the spine close-up from the side and the picture on the right demonstrates what it looks like from the specialist's perspective. One can appreciate how close to the nerves (B) these cages are placed. Pedicle screws (C) interconnected with rods are added to strengthen the construct and keep the segment from moving until the fusion grows. Bone (D) is packed over the sides of the vertebrae to enhance fusion.

My Spine - Lumbar

It is usually assumed that bone growth takes place from six weeks onward and significant bone growth usually only occurs within three to six months. If it takes longer than a year, then it is called a delayed union and if it takes longer than two years one must assume that the fusion is unlikely to unite.

There are a variety of pedicle screw systems and spacer systems available and they are usually detailed in the web pages of the manufacturer. You may want to ask your specialist about the name of the spacer or the pedicle screws that are likely to be used for this purpose. The implants do not constitute a fusion by themselves, because they contain no bone, which always has to be added. The instrumentation purely constitutes a mechanical device which allows fusion to take place in a higher percentage of patients, while at the same time the vertebrae are held in the best position for healing and function of the lumbar spine. The operation is performed from the back, through an incision over the lumbar spine, which is slowly deepened to expose the posterior aspects of the lumbar spine.

Occasionally no decompression of the nerves or approach to the disc area is necessary, in which case the fusion can be done between the transverse processes, the laminae or the spinous processes.

If decompression of the nerves are required, removal of damaged disc or even more extensive removal of the spinous processes and laminae may be needed. In this case the nerves and the spinous dural sleeve (the membrane that contains the nerves) will form part of the operating field. In these cases the bone transplant has to be placed on and in-between the transverse processes on the side of the spinal canal.

The approach from the back is also necessary for the posterior lumbar interbody fusion and for the transforaminal interbody fusion. In the case of a transforaminal interbody fusion, the disc space is accessed from the space available on the outer side of the nerve roots and dural sleeve, underneath the facet joint on that side.

My Spine - Lumbar

Careful attention is paid to obtaining good control of all bleeding points before the wound is closed along the tissue layers. The laminae and spinous processes are not replaced if they have been removed.

Ward care

The initial phase of the post-operative care consists mainly of managing the post-operative pain and of early detection of complications.

Usually you would be expected to get out of bed on the first or second day after surgery. You may usually walk around as much as you want depending on the stability of your spine. Your specialist will advise you about this.

You should avoid sitting for too long or on too low a seat, because this may cause strain on the back and result in pain. Your specialist may recommend a period of time during which you should refrain from sitting. Your specialist also may or may not require you to wear a brace until the bony growth has advanced to the stage where the brace can be discarded.

Discharge

You would normally be discharged at about five to ten days after surgery, depending on the degree of pain and disability you are experiencing and on the absence of any complicating wound factors or concern about your general health at the time.

The hospital staff will assist you in obtaining your follow-up consultation bookings, the prescribed analgesics to take home, the sick leave-certificate to be provided by your doctor and the instructions regarding wound care provisions in the post-operative period.

My Spine - Lumbar

Rehabilitation

It is important that you gradually become more active and mobile and that you follow an exercise programme.

Your return to work should depend on a realistic assessment of your ability to perform your work. After a spinal fusion, it would usually be after two to three months, depending on the type of work you do and the circumstances under which you perform your work.

It is important to follow the exercise programme according to the guidelines laid down by your physiotherapist and later by your biokineticist. You should refrain from exercises that involve impact until you are much more comfortable. Jogging, mountain biking and equestrian pursuits usually have to be delayed for some months.

Follow-up

You will generally be seen by your specialist between two and six weeks following surgery, but you may be seen earlier if there are any complications. The spinal fusion would ordinarily be examined by means of an X-ray of your back a few months after the operation, to evaluate the bone growth between the two vertebrae.

It is important to realise that you will have to protect your back for the rest of your life and apply good back habits (see the chapter *Everyday Life*).

CHAPTER 21



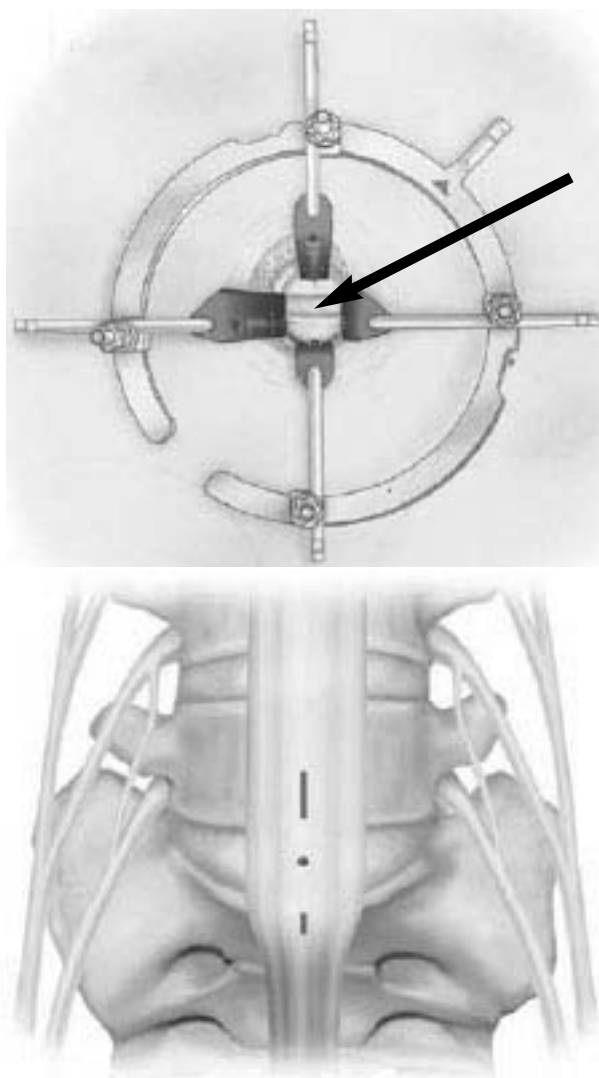
ANTERIOR LUMBAR INTERBODY FUSION (ALIF)

(This is the section that explains the detail of the operation or procedure above and should be read in conjunction with the chapter *Your Back Operation*).

An anterior lumbar interbody fusion (ALIF) is performed to remove a damaged disc. The aim of the operation is to remove the whole disc and to replace it with a spacer and bone chips harvested from your hip (iliac crest) or from donor bone to allow a fusion to grow with time between the two adjacent vertebrae where the disc originally was. This means that the mobility of that section is removed by the growing fusion.

The reason why the disc is removed is because the disc is causing local back pain and referred pain through inflammation or pain down the leg due to the compression of a nerve root.

The idea behind replacing the disc that is removed with a spacer and bone or bone alone, is to remove the origin of the pain, recreate the natural spinal curve, to remove the compression of the nerve structures and finally to create a solid bone block. This creation of a solid bone block does not happen before one year or even longer after the operation. The advantage of operating on the spine from the front is that most of the surgery takes place in front of the spinal canal, and not around the nerves. The further advantage is that in the ALIF procedure there is no or minimal damage to the spinal muscles, which are very important in the normal mobility and stability of the spine.



Images used with permission from Medtronic

Figure 21.1

The top drawing demonstrates an incision in the abdomen with self-retaining retractors holding the skin open. The disc (arrow) can be seen. The bottom drawing demonstrates the anterior longitudinal ligament that runs in front of the spine. This ligament is incised and the disc removed.

My Spine - Lumbar

Sometimes the specialist will perform an ALIF at the lowest level of the lumbar spine (L5/S1) and perform an artificial disc arthroplasty on the level directly above (see the chapter *Lumbar Total Disc Arthroplasty*).

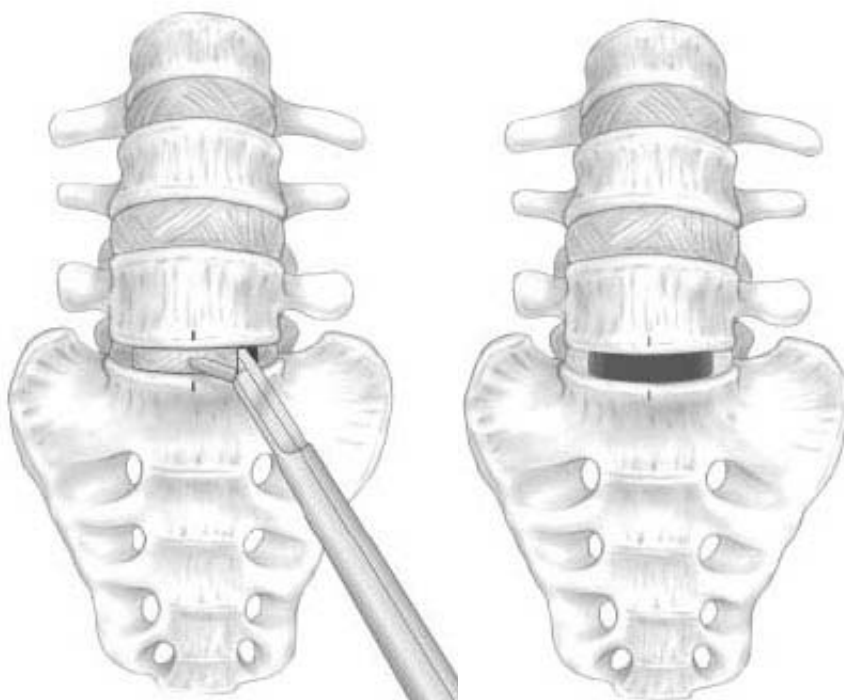
This is frequently performed where the two lowest discs in the spine are damaged and allows the upper level to move freely and not place stress on the levels above.

When undergoing this operation, you will be lying on your back. Your specialist will make a small cut across your belly. This cut can vary from four to ten centimetres to a slightly larger cut, depending on technical factors. It can be a cut across your belly in the position where a cut is sometimes made for a caesarean section or slightly higher, closer to the belly button.

The length of the cut is actually of little consequence to the success of the operation and your specialist would never complicate the operation by limiting the length of the cut. In some cases the specialist will operate through the abdominal sac (peritoneum) that houses the abdominal organs. In other cases the specialist displaces the peritoneum which contains the abdominal organs to one side and then reaches the spine without penetrating into the cavity (peritoneal cavity).

Your specialist then has to temporarily displace the great vessels (aorta, iliac artery, vena cava and iliac vein) away from the disc space. Furthermore, the tubes that carry the urine might be in the way and have to be displaced too. The sympathetic nervous system that regulates the lymph flow in the legs as well as erection and ejaculation in males and vaginal lubrication in females, can also be violated in the procedure. Your specialist should have appropriate training in performing this approach before embarking on this procedure.

When the vertebrae are encountered, the outer ring of the disc is normally incised, opened like a trapdoor and then the entire core of the disc is removed. Thereafter, the implant, which may be a spacer filled with the patient's own bone, bone from the bone bank or synthetic material (inducing bone-growth) is placed in the previously distracted and prepared disc space.



Images used with permission from Medtronic

Figure 21.2

These drawings demonstrate how the disc is incised and removed by instruments to clear the disc space between the vertebrae. This is the space that is filled by a spacer and bone chips to allow the two vertebrae to grow together (fuse). Some of these spacers can be used on their own and others require a posterior (from the back) fusion as well.

My Spine - Lumbar

Following this, the outer layer of the disc is closed with a stitch and the whole abdomen is closed with sutures. In some cases, the anterior interbody fusion is followed by a postero-lateral fusion (see the chapter *Lumbar Fusion*) to increase the chances of fusion and allow the patient to be active earlier in the recovery phase.

Ward care

You would be expected to get out of bed quite soon and usually on the first day following surgery or even on the same day. You may usually walk around as much as you want. It is important that you eat and drink nothing until your specialist specifically allows you to.

The reason for this is because of the possibility of your gut being temporarily paralysed from the surgery. This is mostly because of the traction that is placed on it during surgery to keep it out of the way when the specialist operates around the abdominal sac.

Discharge

You would normally be discharged at about five to ten days after surgery, depending on the degree of pain and disability you are experiencing and on the absence of any complicating wound factors or concern about your general health at the time.

The hospital staff will assist you in obtaining your follow-up consultation bookings, the prescribed analgesics to take home, the sick leave-certificate to be provided by your doctor and the instructions regarding wound care provisions in the post-operative period.

Rehabilitation

It is incredibly important to get a lot of rest and exercise following your surgery. Do not try to rush back to work. It is important to walk for exercise and also exercise in conjunction with the guidelines from your physiotherapist. You may perform activities only as prescribed by your specialist. You should refrain from exercises that involve impact for at least six to nine months. This would include jogging, mountain biking, speed boating, water skiing, volleyball, equestrian pursuits and other strenuous activities.

Follow-up

Routinely you will receive a date for your follow-up appointment with your specialist. This may vary from anything between two and six weeks, but you will be seen earlier if there are any complications. It is important to realise that you will have to protect your back for the rest of your life and apply good back habits (see the chapter *Everyday Life*).

CHAPTER 22



LUMBAR TOTAL DISC ARTHROPLASTY (TDA)

(This is the section that explains the details of the operation or procedure above and should be read in conjunction with the chapter *Your Back Operation*).

A lumbar TDA is performed to remove and replace a damaged disc. The aim of the operation is to remove the entire core of the disc and to replace it with an artificial disc. The reason why the disc is removed is because the disc is thought to be causing local back pain and referred pain into the buttocks, hips and into the thighs. Furthermore, any nerve root compression which may cause your back pain and radicular pain all the way down into the foot can also be addressed with the same operation.

The idea behind replacing the disc that is removed with an artificial disc rather than fusing that level, is to maintain the spinal movement on that specific level. It is believed that fusing a level changes the biomechanics of the adjacent level. In short, it means that the spinal movement (biomechanics) is altered and that this adversely affects the adjacent level, causing premature damage on that level.

The aim with a TDA is to maintain movement of the affected spinal level and to prevent added stress on the discs and joints of the adjacent levels.

My Spine - Lumbar

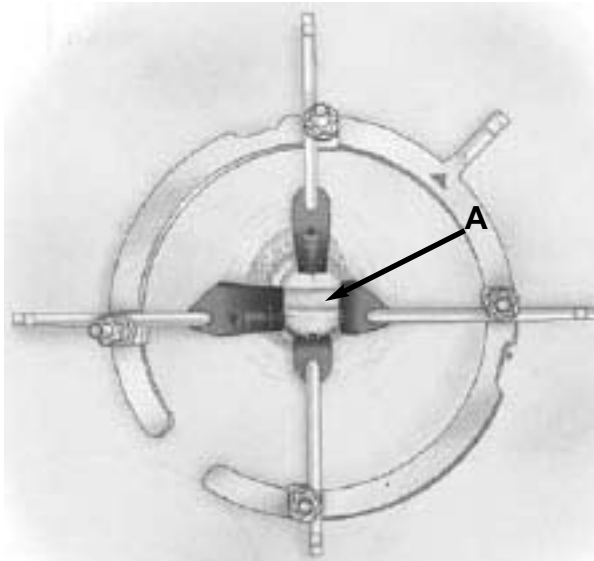


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Figure 22.1

This drawing demonstrates the approach for a lumbar disc arthroplasty. This is a drawing of a patient's stomach (abdomen). Note the ring-like retractor that has been placed on the abdomen to keep the wound open. The structure that can be seen in the depth is the intervertebral disc (A) between two vertebrae. In this case the specialist operated through the abdominal sac (peritoneum) that houses the abdominal organs. In other cases the specialist displaces the peritoneum which contains the abdominal organs to one side and then reaches the spine without penetrating into the cavity (peritoneal cavity). Your specialist then has to displace the major vessels (aorta, iliac artery, vena cava and iliac vein) away from the disc space. Furthermore, the tubes that carry the urine might be in the way and have to be displaced. The sympathetic nervous system that regulates the lymph flow in the legs as well as erection and ejaculation in males and vaginal lubrication in females, can also be violated in the procedure. Your specialist should have appropriate training in performing this approach before embarking on this procedure.

My Spine - Lumbar

When undergoing this operation, you will be lying on your back. Your specialist will make a cut on your belly. This cut can vary from five to ten centimetres (smaller incisions are not possible due to the size of the implant). It can be an up-and-down (vertical) cut or a cut across your belly (horizontal). The position of the cut depends mainly on the level of the spine where your disc is replaced.

Your specialist will usually attempt to work down to the vertebrae without entering the abdominal sac by working around it and pulling the abdominal sac and its entire content to one side. On other occasions the approach can be through the abdominal sac. There are important structures such as the bowel, blood vessels and the ureters (tubes from the kidney carrying the urine to the bladder) and nerves that your specialist must carefully avoid during this operation.

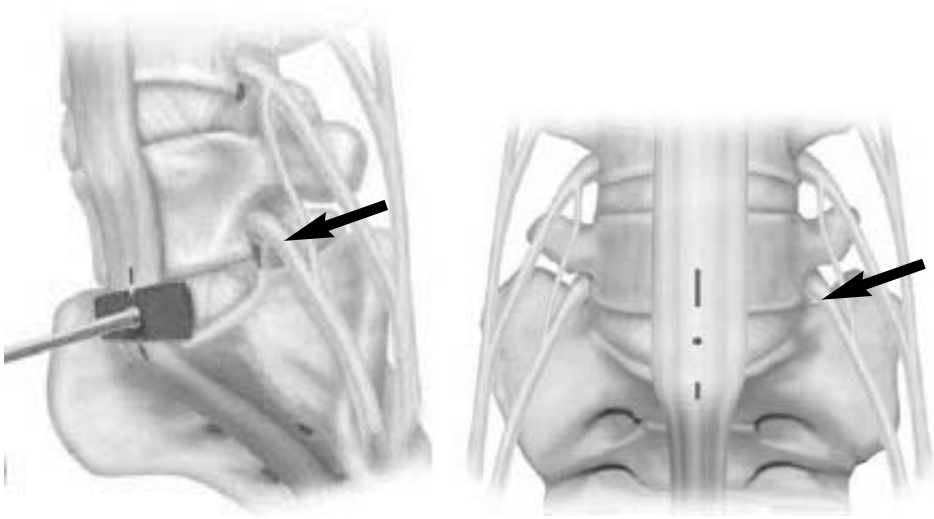
When the vertebrae are encountered, the disc is removed totally. At this point, an artificial disc prosthesis is placed in the space. This has to be done carefully under guidance of an X-ray machine to ensure that the prosthetic disc is perfectly positioned. The biggest reason for failed operations is the misplacement of the prosthetic disc. Therefore, the placement is crucial. Following the placement of the prosthesis, the wound is stitched up.

Ward care

You would be expected to get out of bed quite soon and usually on the first day following surgery or even on the same day. You may normally walk around as much as you want. It is important that you eat and drink nothing until your specialist specifically allows you to.

The reason for this is because of the possibility of your gut being temporarily paralysed from the surgery. This is mostly because of the traction that is placed on it during surgery to keep it out of the way when the specialist operates around the abdominal sac.

My Spine - Lumbar



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Figure 22.2

These drawings demonstrate the way your specialist will find the middle of the disc that is being removed. An instrument like this one is used in conjunction with an X-ray machine. It is of critical importance that the middle is accurately marked as the prosthesis will only function correctly if it is placed in the midline.

After the middle has been marked, the whole disc is removed up to the column of nerves in the spinal canal and care is taken to make sure that these nerves are not being compressed and also that these nerves are not damaged during the procedure. The nerves that go down to the leg are located at the side of the disc (arrow). This is frequently where these nerves are compressed by a disc fragment.

My Spine - Lumbar

Discharge

You would normally be discharged at about five to ten days after surgery, depending on the degree of pain and disability you are experiencing and on the absence of any complicating wound factors or concern about your general health at the time.

The hospital staff will assist you in obtaining your follow-up consultation bookings, the prescribed analgesics to take home, the sick leave-certificate to be provided by your doctor and the instructions regarding wound care provisions in the post-operative period.

Rehabilitation

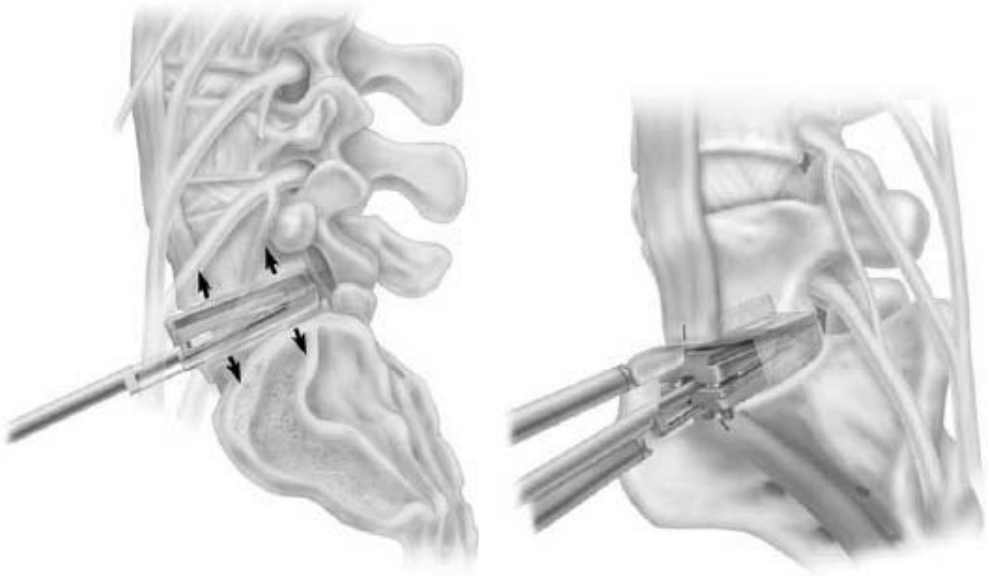
It is incredibly important to get a lot of rest and exercise following your surgery. Do not try to rush back to work. It is important to walk for exercise and also exercise in conjunction with the guidelines from your physiotherapist. You may perform activities only as prescribed by your specialist. You should refrain from exercises that involve impact for at least six to nine months. This would include jogging, mountain biking, speed boating, water skiing, volleyball, equestrian pursuits and other strenuous activities.

Follow-up

Routinely you will receive a date for your follow-up appointment with your specialist. This may vary from anything between two and six weeks, but you will be seen earlier if there are any complications.

It is important to realise that you will have to protect your back for the rest of your life and apply good back habits (see the chapter *Everyday Life*).

My Spine - Lumbar



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Figure 22.3

The drawing on the left demonstrates how the disc space is loosened up with an instrument after the disc was completely removed. This will allow for the correct placement of the artificial disc prosthesis. The drawing on the right demonstrates how the vertebral body is given grooves for the prosthesis keel to fit in. Not all disc prosthesis have keels.

The top drawing on the opposite page demonstrates the artificial disc prosthesis as seen from the side and the bottom drawing as seen from the front, after it has been placed in position between the vertebrae where the damaged disc has been removed.

The prosthetic disc has to be placed in the middle of the vertebrae as seen from the front and has to be placed far enough backwards so that the motion of that spine segment is normal, without placing it too deeply. If it is placed too deeply, the prosthesis might push up against the nerves and cause pain or weakness in the leg and if it is too shallow, it may dislodge towards the front.

My Spine - Lumbar



Images used with permission from Medtronic

CHAPTER 23

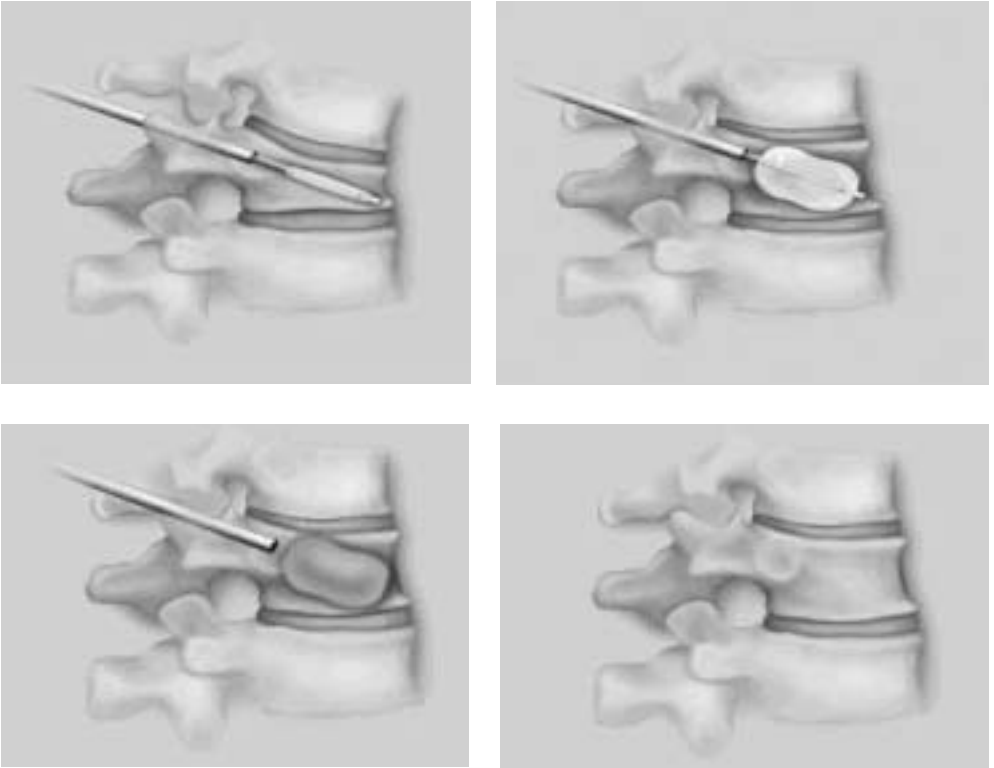


KYPHOPLASTY AND VERTEBROPLASTY

(This is the section that explains the detail of the operation or procedure above and should be read in conjunction with the chapter *Your Back Operation*).

The treatment of vertebral compression fractures historically revolved around bed rest, analgesic medication and the use of a brace (corset) for extended periods. Spinal compression fractures can take up to 6–18 months to heal and in some cases might never heal. In some patients the pain becomes tolerable after 1–2 months despite the fact that the fracture has not healed. Where the use of steroids is the cause of the spinal fractures, the patient often presents with multiple vertebral fractures, severe collapse and extensive complications without treatment. A painful fracture that has not healed can qualify for operative treatment if the MRI scan reveals that the fracture has not healed. This means that some fractures can still be surgically treated after a year.

Kyphoplasty and Vertebroplasty are minimally invasive procedures to mainly, but not exclusively, treat osteoporotic and metastatic vertebral compression fractures of the spine and sacrum. These procedures are performed to stabilise the bodies of the collapsed (fractured) vertebrae and restore the height of the vertebrae.



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Figure 23.1

In a Kyphoplasty procedure, a balloon is inserted into the vertebral body through the needle and the vertebra is lifted up under the pressure that the balloon generates when it is filled with fluid. Thereafter, the balloon is removed and the void carefully filled with bone cement. All of this is performed under constant fluoroscopic guidance.

My Spine - Lumbar

These procedures are also used to treat haemangioma (benign vascular tumours of the spine), to reinforce soft bone with bone cement before insertion of pedicle screws and rods (see the chapter *Lumbar Fusion*) and in reduction and splinting of traumatic fractures. Treatment with Kyphoplasty and Vertebroplasty should be performed according to strict treatment protocols. Kyphoplasty is a technically demanding procedure and requires that specialists attend a formal training course. Fractures in the soft, osteoporotic vertebrae of the older patient are fixed with bone cement (PMMA) which acts as glue and increases the inherent strength of the vertebrae. Fractures in the normal, hard vertebrae of younger patients are splinted with calcium phosphate, as opposed to using PMMA. Calcium phosphate undergoes remodeling and gets absorbed in time. These procedures should only be done by trained specialists in hospitals with proper equipment.

There are a few significant differences between Kyphoplasty and Vertebroplasty.

In both these procedures PMMA is injected into the vertebrae. With Kyphoplasty the shape and height of the collapsed vertebrae can be restored to varying degrees. This is achieved by increasing the height of the fractured vertebrae by inserting a cannula through the skin of the back into the vertebral body. A balloon that can generate high pressures is inserted through the cannula and inflated to achieve this. By increasing the height of the fractured vertebrae and restoring the alignment of the spine, the stress in the adjacent vertebral segments is reduced. This is thought to diminish the incidence of adjacent vertebral fractures. In Vertebroplasty the fracture is partially restored and therefore the height of the vertebral body by positioning the patient on bolsters in a specific manner in theatre prior to the PMMA being injected. This is less efficient in restoring height than is the case in Kyphoplasty.

The incidence of cement leakage in Kyphoplasty is lower than in Vertebroplasty, since a cavity is created within the vertebral body by means of an inflatable balloon, before the cement is injected into the cavity. In Vertebroplasty, the cement is injected under pressure into the vertebra and the flow of cement may be difficult to control and this may lead to leakage.

My Spine - Lumbar

The difference in the pressure generated during cement injection is especially important in the treatment of metastatic fractures where the outer layer of the vertebra is softer. Kyphoplasty is therefore a safer procedure in these patients. In both procedures significant improvement in pain can be achieved within hours of the procedure.

There is a significant difference in the cost between the two procedures.

The success of both procedures not only depends on surgical finesse and experience, but on proper follow-up. In osteoporotic patients the vertebrae adjacent to the treated vertebra, are also osteoporotic. Therefore, pain experienced after a previous Kyphoplasty or Vertebroplasty is an indication of another vertebral fracture, unless proven otherwise.

It is important to perform a specific sequence MRI scan before a Kyphoplasty or Vertebroplasty procedure is carried out, since it is impossible to distinguish between an old, healed fracture and a new fracture on X-rays or a CT scan. The MRI scan is also useful in diagnosing adjacent or distant damaged vertebrae with impending fractures. It is therefore necessary to have an up to date MRI scan prior to commencing treatment with Kyphoplasty or Vertebroplasty.

It is important to have a proper first consultation with a specialist where a full medical history, physical examination and appropriate scans are performed. It is advisable that a family member accompany the patient on the first visit so that all parties are educated with regards to the pathology, treatment and potential complications. After a Kyphoplasty or Vertebroplasty procedure was performed, it is crucial that the patient is followed-up within weeks of the procedure in order to exclude any complications and to diagnose any new fractures.

The patient and the family must know that if and when the patient experiences new acute pain after surgery from the first week onwards, it is vital that the patient is seen by a specialist immediately. The specialist will determine whether there is progressive collapse of the vertebrae that necessitates another operation.

My Spine - Lumbar

Treating new fractures promptly reduces the pain associated with the fracture and prevents multi-level disease. Multi-level osteoporotic vertebral fractures leads to progressive kyphosis (increased angle or forward bend of the spine) which can lead to other morbidities such as decreased lung function, congestive heart failure, bowel problems, depression, satiety, flatulence and other complications.

There is a small risk of bone cement leakage involved with Kyphoplasty and Vertebroplasty procedures. Bone cement leaking out of the vertebral body can irritate or damage the spinal cord or nerves. This can cause pain, abnormal sensation, or very rarely, paralysis. In severe cases of cement leakage, an operation may be needed to stop the irritation of the nerves and spinal cord. There is also a small risk of the cement travelling via blood channels in the bone and blood vessels to the patient's lungs.

Ward care

Log-rolling (where the patient's hips and shoulders are kept in alignment) is allowed immediately following the procedure. The patient may sit or walk as soon as they feel up to it, but must be assisted by a member of the nursing staff or a physiotherapist. If the patient is too frail, mobilisation can commence the next morning. The use of a brace is normally not required, except in young patients where fractures were treated with calcium phosphate. Improvement of symptoms is usually immediate with full recovery in the first month depending on factors such as the number of fractured vertebrae as well as the time elapsed since the fracture occurred.

Discharge

Patients are normally discharged the day after the procedure if there are no complications or co-morbidities necessitating a longer stay. You may be given analgesic medication, a back exercise routine and a follow-up date. You are advised to contact your specialist prior to your follow-up date if you experience any undue discomfort after your discharge.

My Spine - Lumbar

Rehabilitation

Rehabilitation consists of a strict back routine. You are not allowed to bend or twist your back during your rehabilitation period. Use the log-rolling technique when turning over in bed. You are allowed to sit, stand, kneel, walk and drive a vehicle. If you experience acute pain, contact your specialist immediately.

Follow-up

During the follow-up appointment your specialist will discuss ongoing osteoporotic treatment, investigate the cause of any persisting pain or new symptoms and discuss the treatment of co-morbidities.

It is important to realise that you will have to protect your back for the rest of your life and apply good back habits (see the chapter *Everyday Life*).

CHAPTER 24



SCOLIOSIS SURGERY

(This is the section that explains the detail of the operation or procedure above and should be read in conjunction with the chapter *Your Back Operation*).

Surgery for scoliosis is indicated when non-operative measures fail. The reason for surgery may be an extremely large curve or deformity or evidence that the curve is progressing and a large curve is expected in the future. This is typically the case in teenagers who develop scoliosis during their growth spurt. If these curves become enlarged, not only do they have cosmetic effects, but they also have a negative effect on respiratory function (breathing difficulties). Another reason for intervention would be in the adult age group where excessive wear and tear has occurred resulting in a degenerative scoliosis. This is typically in the lower back (lumbar) area and can cause both back and leg pain.

The aim with scoliosis surgery is to correct the curve and to hold it in a corrected position while a bony fusion occurs. In other words, the patient trades a skew spine for a straight, rigid one. It is not possible to correct the curve without taking away spinal movement and this needs to be considered before embarking on surgery.

Before surgery, certain investigations are necessary. Dynamic X-rays, where the patient bends to the left and the right during the X-ray process, assists in deciding which part of the spine needs to be treated. A Magnetic Resonance Scan (MRI) may be necessary to exclude other spinal cord pathology.

My Spine - Lumbar



Image used with permission from Dr RN Dunn

Figure 24.1

My Spine - Lumbar

A thorough history of other medical problems and medication used is needed to minimise complications. There are various surgical options with increasing complexity and risk. The following procedures are available.

Anterior release

Anterior means from the front and describes an approach either through the chest or abdomen. The release is never done as the only procedure and needs to be followed by a stabilisation operation.

The release increases the flexibility of the skew spine. It is indicated in patients with an extremely rigid spinal curve, which is not easily correctable.

If the scoliosis is in the thoracic (chest) spine, this requires an approach through the chest. Here, an oblique incision is made in line with one of the ribs, the chest opened, the lung moved to the side and the spine inspected. The intervertebral discs are then removed from between the vertebral bodies to allow more spinal movement and to encourage bony growth between the vertebrae at a later stage. Some of the rib heads may be resected to further increase the flexibility.

The patient needs to have a chest drain (intercostal drain) inserted post-operatively to drain the air and blood and patients can expect a degree of discomfort for a few weeks due to the motion of breathing that causes movement at the repaired rib entry site.

Anterior corrective fusion

Should the curve be readily correctable, as assessed pre-operatively with dynamic X-rays and a clinical examination, the whole corrective process can be done with surgery from the front. This is typical for lumbar (lower back) scoliosis. In this instance the discs are removed as above, but in addition screws are placed into each vertebral body and connected with a rod. During this process the skew spine is forced to connect to a straight rod and thus straightened out. This technique has the advantage of minimal blood loss and muscle damage.

My Spine - Lumbar

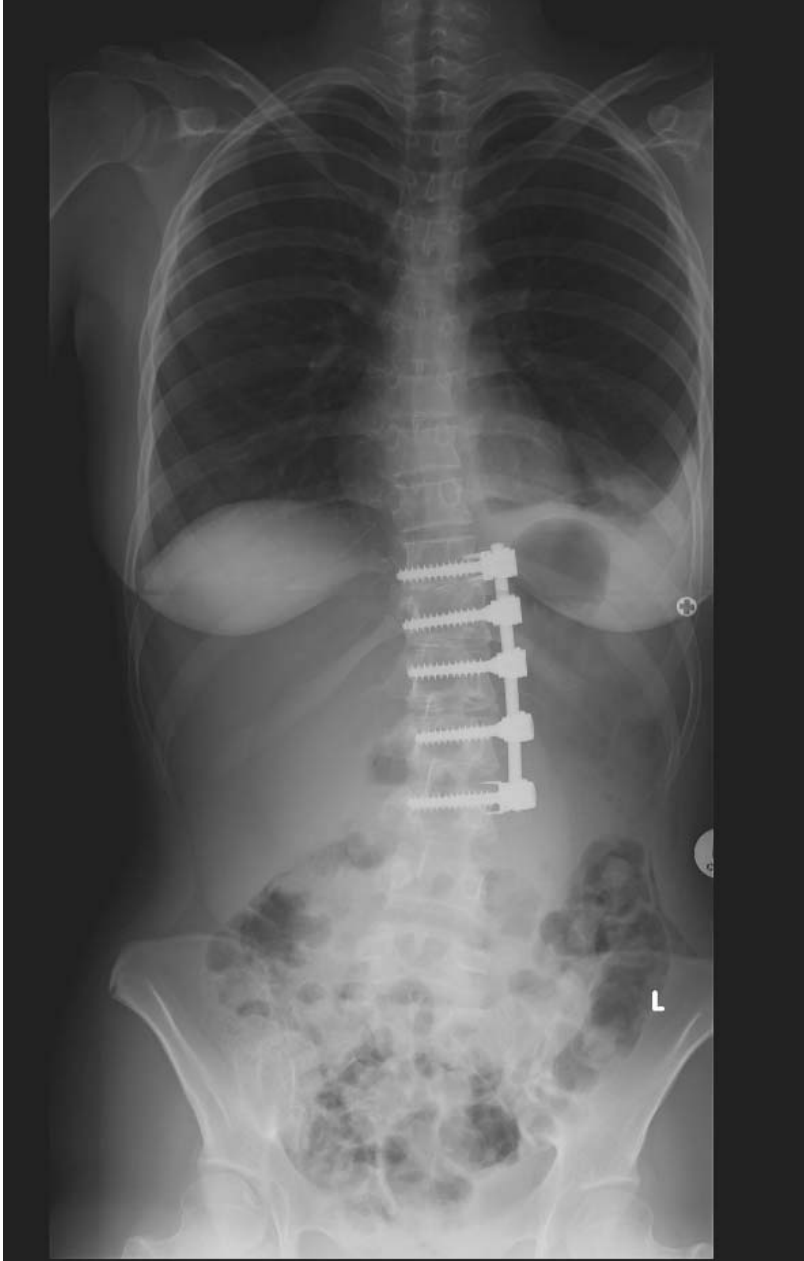


Image used with permission from Dr RN Dunn

Figure 24.2

My Spine - Lumbar

Posterior corrective fusion

This is the commonest option employed in the management of scoliosis. The spine is exposed from behind, by stripping the muscles to the side. Hooks and screws are fixed into the spine. This carries some risk as they are close to the nerves.

Once the connection points are placed, the facet joints are resected from the spine to encourage a fusion, in other words the formation of a solid bony bridge. Two rods are then applied, one on the left and one on the right. The rods are attached to the connectors in a sequential fashion, forcing the spine into a straight line. This corrects the scoliosis.

These interventions are considerable and a patient can expect to stay in hospital for seven to ten days including one to two nights in the High Care Unit. Blood transfusions are generally required. The first few days following surgery are extremely painful and morphine type medication is required which may cause nausea and drowsiness.

Risks of scoliosis surgery

All surgery brings risk. The general risk of infection is present, but relatively low at around 0,8%. It is even lower with the anterior approaches. There is a risk of non-union, or failure of the bone to grow together (fuse). Should this occur, the instrumentation will probably fatigue and break at around 12-18 months post-operatively with pain and a loss of correction.

The risk most feared is neurological injury (paralysis). Although this risk is ever present, it is rare, with a chance of 1:300 of any neurological event ranging from some numbness to total paraplegia (unable to move or feel legs). This can occur from the corrective process and increased strain on the spinal cord or from reduced blood supply to the cord.

To reduce the risk of neurological damage, some surgeons use spinal cord electrical monitoring during the procedure, although this is not fail-safe and has its own technical challenges. Should there be a problem in the immediate post-operative phase, urgent instrumentation removal may be required.

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Ward Care

Generally these patients start to walk one to two days after the surgery. They do not usually need a brace unless there is concern regarding the grip of the screws/hooks in the bone. The physiotherapist and nursing staff will ensure that the mobilisation is done safely.

Discharge

You would normally be discharged about a week after your operation. Staff at the hospital will take care of your follow-up consultation, analgesia to take home, sick leave-certificate and wound care provisions in the post-operative period.

Rehabilitation

It is incredibly important to get a lot of rest and exercise following your surgery. Do not try to rush back to work. It is important to walk for exercise and also exercise in conjunction with the guidelines from your physiotherapist. You may perform activities only as prescribed by your specialist. There will be permanent restrictions in terms of sport and one cannot play contact sport, however, controlled activity is recommended.

Follow-up

Typically patients will be off school or work for six to twelve weeks. Regular follow-up with X-rays are done to assess the fusion process.

It is important to realise that you will have to protect your back for the rest of your life and apply good back habits (see the chapter *Everyday Life*).

CHAPTER 25



EVERYDAY LIFE

Spinal pain can limit your activities of everyday life and decrease your quality of life dramatically if not properly managed. Pain is a warning system and is the body's way of informing you that something is wrong.

Maintaining the correct body posture during everyday life activities can significantly assist in reducing back pain and progressive spinal damage.

The following advice could be helpful in managing your back pain during everyday activities.

Sitting

A well designed chair should provide comfortable seating and accommodate a wide range of body shapes and sizes. To maximise sitting comfort, it is essential that the chair is adjustable.

Make sure that you maintain a correct posture and are supported comfortably in the chair:

- Your feet should be flat on the floor; do not cross your legs.
- The height of the chair is important, because your hips should be at a right angle or ideally between 90° and 120°.
- If your feet do not comfortably touch the floor, use a low footrest.
- A low footrest may also be necessary to reduce pressure behind the knees and strain in the lower back.

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- Ensure that your back is well supported and that you maintain an upright position.
- The backrest of the chair should be upright and provide proper support for your back, neck and head.
- A small cushion or rolled towel can be placed in the hollow of your back to allow for better lumbar support.

Correct sitting posture while writing

- Ergonomically designed posture chairs are ideal to prevent spinal pain.
- Your head should be aligned with your shoulders and hips.
- The seat should ideally be able to tilt slightly forward.
- Adjust the height of the chair so that your hips are slightly higher than your knees.
- Place one foot slightly more forward than the other and alternate the position of your feet throughout the day.
- Writing on a surface that slopes upwards will help you in maintaining an upright position of your head and prevent you from slouching.
- The height of the desk is also important, because your elbows should be just below the level of the desk.
- It is important to maintain an upright position; do not slouch.
- Do not sit for long periods at a time and try to get up and move around every half hour.

Correct sitting posture while working at a computer

- Ergonomically designed posture chairs are ideal to prevent spinal pain.
- Your head should be aligned with your shoulders and hips.
- The seat should ideally be able to tilt slightly forward.
- Adjust the height of the chair so that your hips are slightly higher than your knees.
- Place one foot slightly more forward than the other and alternate the position of your feet throughout the day.
- The height of the desk is important and your elbows should be on the same level as the keyboard; keep your shoulders relaxed.

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- When using a desktop computer, the screen should be raised so that the top of the computer screen is more or less level with your eyes. The screen should preferably be tilted upwards so that you do not have to flex your neck.
- Laptop computers should not be used on your lap, but should rather be placed on a desk with the screen at the same height as was described for a desktop computer.
- It is important to maintain an upright position; do not slouch.
- Do not sit for long periods at a time and try to get up and move around every half hour.

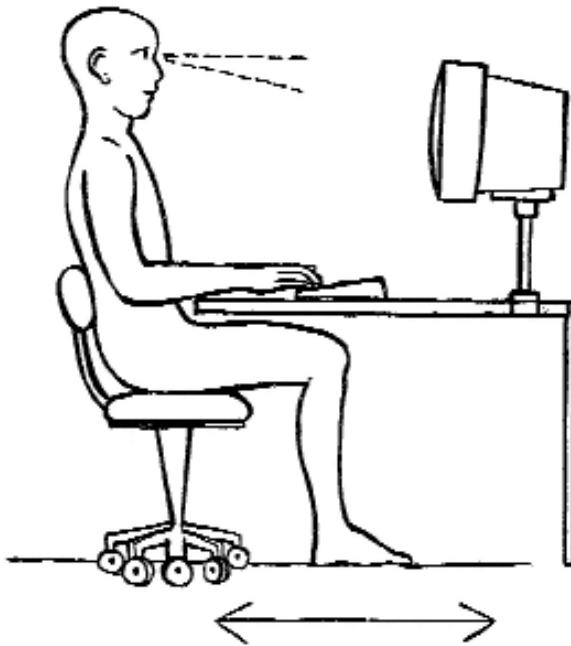


Figure 25.1

My Spine - Lumbar

Moving objects by pushing and pulling

It is important to know that pushing puts less strain on the back than pulling.

- Keep your back straight and tighten your stomach muscles.
- Make sure you are close to the object by leaning in slightly towards the object.
- Keep your feet shoulder width apart and one foot slightly more forward than the other.
- Bend your knees and use the strength of your leg muscles and the weight of your body to move the object.
- Rather than pushing or pulling by facing the heavy object, you can turn around and push the load with your back braced against the support.
- Use the strength of your leg and thigh muscles to do the work and do not twist your body.

Lifting heavy items

It is very important never to lift an object with an improper lifting technique, as this could result in serious spinal injury.

The illustration on the opposite page indicates how pressure on the discs (that are located between the vertebrae) increases during an improper lifting technique (drawing on the left). Note how the pressure in the disc is unevenly distributed when the back is bent (flexed). This can result in a tear (rupture) of the disc and the soft centre can squeeze out and press against a spinal nerve, causing leg pain and even leg weakness, and may result in surgery.

- Always keep your back straight and tighten your stomach muscles when lifting an object.
- Make sure you are close to the object and have a firm hold on it.
- Keep your feet shoulder width apart to ensure a firm base of support.
- Bend your knees and use the strength of your leg muscles to lift the object.
- Do not twist your body, but rather give small steps with your feet to move the object.

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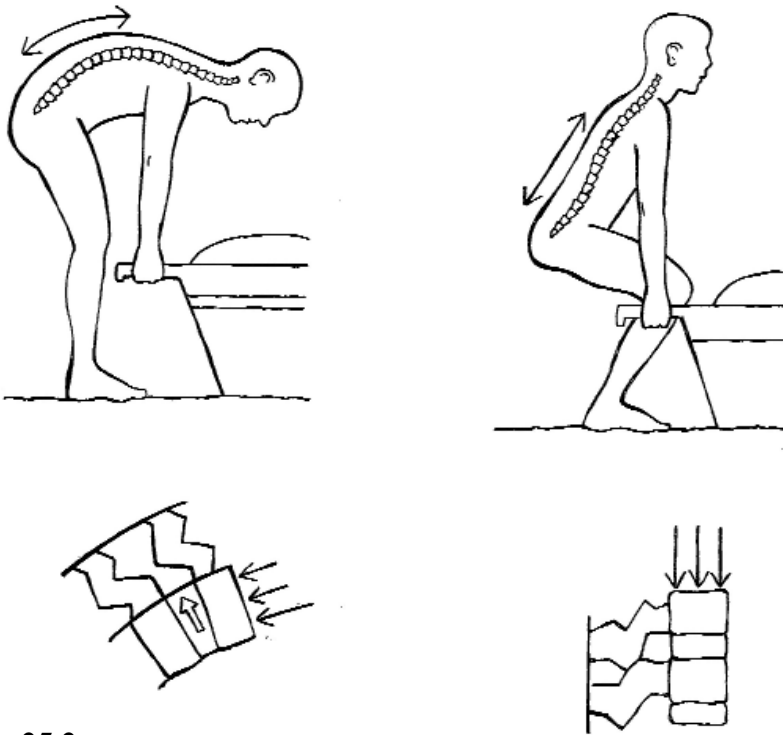


Figure 25.2

Going shopping

It is sensible to go shopping during off-peak hours to reduce the amount of time spent shopping and also to avoid the need to stand for prolonged periods in long queues. When reaching for articles on the shelves, you should bend your knees to reach the shelves that are very low or you should ask for assistance. You should also ask for assistance when reaching for articles above eye-level. Use a trolley that runs smoothly and do not fill it too heavily so that it is difficult to manoeuvre.

- Consider online shopping and delivery services.
- Ask a shop assistant to carry your parcels and load them into your car.
- Go shopping more often and buy smaller quantities at any one time.
- When lifting groceries in and out of the car, keep items close to the body, bend your knees and keep your back straight.

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Pregnancy and child care

During pregnancy the joints and ligaments in the area of the back and pelvis become more lax (due to hormonal changes) in preparation of the birth of the baby, making a pregnant woman more prone to pain and back injury. A pregnant woman's posture is affected by adapting to compensate for the effect of the added load of the growing baby at the front of the body. There is a tendency to arch the back and slightly lean backwards when standing and walking, especially in the later stages of pregnancy. Try and maintain a proper posture by "standing tall" and tightening your stomach and pelvic floor muscles. Take extra care to protect your back during pregnancy and also caring for your baby after birth.

- Wear comfortable, low heeled shoes when walking.
- Sit with your back properly supported. Do not sit in a chair that is too low, for it is difficult to stand up again. Try not to sit for long periods at a time; get up every half hour and move around.
- When feeding your baby, sit in a chair with your hips, knees and ankles at a right angle.
- The baby cot should be at a proper height so that you do not have to bend your back to pick your baby up.
- Lower the side of the baby cot before lifting your baby or putting your baby down.
- If the baby cot is close to the floor, make sure that you kneel or squat when lifting your baby.
- When lifting your baby, remember to always keep your back straight, to tighten your stomach muscles and to keep your baby close to your body.
- Use a changing table or elevated work surface (with the proper height) when changing your baby's clothes or nappy.
- Place the bath on a sturdy surface at your hip height. Kneel when bathing your baby in a regular bath.
- Before lifting your baby from a regular bath, empty the bathwater, but cover your baby to retain the heat; then step into the bath with one foot (remember to use a non-slip bath mat). Sit on the rim of the bath and avoid twisting your back when lifting your baby.

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- Remember to hold your baby close to your body when lifting her out of the bath.
- Once you are holding your baby firmly, carefully bring your leg back over the rim of the bath and stand up with both feet firmly on the floor.
- Avoid carrying your baby on one hip for extended periods of time, for this places excessive stress on your spine.
- Go down on your knees when you want to pick your child up from the floor or a low chair. Once again, remember to keep your elbows close to your body.
- If your baby is on the floor, you can always go down on the floor and allow your baby to crawl onto your lap.
- When your child is old enough, she can stand on a chair or step before you pick her up. You can then let her slide onto your knee or use a squat-lift while keeping your back straight.



Figure 25.3

My Spine - Lumbar

Sport and exercise

A degree of physical activity is most often beneficial in limiting spinal pain. Sport and regular exercise assist in keeping your body fit and your muscles strong and it could help in reducing back pain. It is essential that you strengthen your stomach muscles and your leg muscles.

When participating in sport, it is important to keep the following in mind:

- Sport that requires a twisting action of your back or that involves excessive jumping (causing a jarring force on the discs) could have an adverse effect on your back pain.
- Avoid sport or exercises that increases your back pain. Sporting activities that are recommended for people with back pain would include swimming, walking, cycling and low impact aerobic exercises.
- Some sporting activities such as bowls require a great deal of bending. Protect your back by keeping it straight and by tightening your stomach muscles. Use your strong leg muscles as much as possible when executing movements that involve bending.
- Thorough warm-up exercises should be completed before commencing with your sporting activity. Regular stretching exercises are also important in preventing sport related injuries.

Sexual activity

Sexual activity is frequently inhibited by acute pain. A positive attitude and proper communication with your partner could help you overcome apprehension and anxiety caused by your spinal pain. Try a different approach to making love by adapting to a position that your back can tolerate.

Sexual intercourse provides a natural pelvic tilt movement which is to be encouraged to relieve lower back pain. However, sexual intercourse can exacerbate the pain in acute phases.

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To help reduce the tension, it is important that your partner understands your condition. Together you can experiment with different positions and try to work out which position is most comfortable and satisfactory. The endorphins that are released during intercourse help block pain signals and promote the feeling of well-being.

There are many different positions to experiment with, but the basic rule is that the partner in pain should be in the most comfortable position.

- The partner in pain should adopt the most favourable position with regards to comfort.
- Try a position in which the natural curve of the back is maintained.
- Avoid excessive arching of the lower back.
- Avoid bending forward.
- Avoid vigorous thrusting. You may find that the less active role may be the most comfortable, but not necessarily less enjoyable and satisfying.
- A firm mattress is vitally important.
- A pillow can be used for extra support.
- You may find that analgesics taken 30–40 minutes prior to sexual activity or taking a warm bath may be beneficial in lessening pain and alleviating the fear of pain.
- If sexual intercourse causes increased pain, non-penetrative sexual activity can be just as satisfying.
- For further advice or to discuss specific problems with regards to back pain and sexual activity, a health professional or sex therapist should be consulted.

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These illustrated sexual positions can be helpful for people experiencing back pain.



Figure 25.4

The positions above are beneficial for women with back pain.



Figure 25.5

The positions above are beneficial for men with back pain.

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Figure 25.6

This would be the correct position to adopt if both partners suffer from back pain.

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