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MY SPINE

SOUTH AFRICAN TRIAL EDITION

Cervical

E Coetzee, GHJ Coetzee, DJJ de Klerk, RN Dunn, JJ du Plessis,
JH du Preez, JC du Toit, MD du Treu, ND Fisher-Jeffes, GAG Fuller,
GJ Geldenhuys, R Gopal, ST Govender, UR Hähnle, HB Hartzenberg,
V Karan, CF Kieck, EM Kiratu, D Lamprecht, PL Lekwara,
WA Liebenberg, G Marus, DP Maseko-Magongo, SS Nadvi,
A Oberholzer, AH Parbhoo, PH Roux, BJ Schuttee, FD Snyckers,
FL van der Merwe, HJ van Dyk, L van Wyk, AJ Vlok, GJ Vlok,
FJ Wahl, DG Welsh, LS Wessels

Vesuvius Books

My Spine – Cervical

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Published by Vesuvius Publishing (Pty) Ltd. (SA)
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Contributors

Dr E Coetzee – Orthopaedic Surgeon

Private Practice, Pretoria, South Africa

Dr GHJ Coetzee – Neurosurgeon

Private Practice, Cape Town, South Africa

Dr DJJ de Klerk – Neurosurgeon

Private Practice, Pretoria, South Africa

Dr RN Dunn – Orthopaedic Surgeon

Lecturer Groote Schuur Hospital, University of Cape Town and Private Practice, Cape Town, South Africa

Dr JJ du Plessis – Neurosurgeon

Private Practice, Pretoria, South Africa

Dr JH du Preez – Neurosurgeon

Private Practice, Mossel Bay, South Africa

Dr JC du Toit – Anaesthetist

Private Practice, Paarl and Cape Town, South Africa

Dr MD du Trevou – Neurosurgeon

Lecturer Nelson R Mandela School of Medicine and Private Practice, Durban, South Africa

Dr ND Fisher-Jeffes – Neurosurgeon

Private Practice, Cape Town, South Africa

Dr GAG Fuller – Neurosurgeon

Senior Lecturer Nelson R Mandela School of Medicine and Private Practice, Durban, South Africa

Dr GJ Geldenhuys – Orthopaedic Surgeon

Private Practice, Pretoria, South Africa

Contributors

Prof R Gopal – Neurosurgeon

Head of Neurosurgery Wits Medical School and Private Practice,
Johannesburg, South Africa

Dr ST Govender – Neurosurgeon

Lecturer Nelson R Mandela School of Medicine and Private Practice,
Durban, South Africa

Dr UR Hähnle – Orthopaedic Surgeon

Private Practice, Johannesburg, South Africa

Prof HB Hartzenberg – Neurosurgeon

Professor and Head, Department of Neurosurgery, Tygerberg Hospital and
University of Stellenbosch, Cape Town, South Africa

Dr V Karan – Neurosurgeon

Head of Neurosurgery, Inkosi Albert Luthuli Central Hospital (Nelson R
Mandela School of Medicine), Durban, South Africa

Dr CF Kieck – Neurosurgeon

Private Practice Cape Town, South Africa

Dr EM Kiratu – Neurosurgeon

Inkosi Albert Luthuli Central Hospital, Durban, South Africa

Dr D Lamprecht – Neurosurgeon

Lecturer Stellenbosch University Medical School and Private Practice, Cape
Town, South Africa

Dr PL Lekgwara – Neurosurgeon

Acting Head of Neurosurgery, Medunsa and Dr George Mukhari Hospital,
Pretoria, South Africa

Dr WA Liebenberg – Neurosurgeon

Private Practice, Paarl, South Africa

Contributors

Dr G Marus – Neurosurgeon

Private Practice, Johannesburg, South Africa

Dr DP Maseko-Magongo – Neurosurgeon

Private Practice, Kempton Park, South Africa

Dr SS Nadvi – Neurosurgeon

Lecturer Nelson R Mandela School of Medicine and Private Practice,
Durban, South Africa

PN A Oberholzer – Private Nursing and Scrub Practitioner

Private Practice, Paarl, South Africa

Dr AH Parbhoo – Orthopaedic Surgeon

Private Practice, Durban, South Africa

Dr PM Roux – Neurosurgeon

Private Practice, Durban, South Africa

Dr BJ Schutte – Orthopaedic Surgeon

Private Practice, Cape Town, South Africa

Dr FD Snyckers – Neurosurgeon

Private Practice, Johannesburg, South Africa

Dr FL van der Merwe – Neurosurgeon

Private Practice, Cape Town, South Africa

Dr HJ van Dyk – Orthopaedic Surgeon

Private Practice, Pretoria, South Africa

Dr L van Wyk – Orthopaedic Surgeon

Private Practice, Cape Town, South Africa

Dr AJ Vlok – Neurosurgeon

Tygerberg Hospital, Cape Town, South Africa

Contributors

Prof GJ Vlok – Orthopaedic Surgeon

Head of Department Orthopaedic Surgery, Tygerberg Hospital and Stellenbosch University, Cape Town, South Africa

Dr FJ Wahl – Orthopaedic Surgeon

Private Practice, Somerset West, South Africa

Dr DG Welsh – Neurosurgeon

Lecturer Groote Schuur Hospital, University of Cape Town and Private Practice, Cape Town, South Africa

Dr LS Wessels – Neurosurgeon

Private Practice, Somerset West, South Africa

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 – Cervical 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** Neck Pain
- CHAPTER 3** Cervical Slipped Disc
- CHAPTER 4** Cervical Spondylotic Myelopathy
- CHAPTER 5** Whiplash Injuries
- CHAPTER 6** Tests and Scans
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- CHAPTER 17** Cervical Disc Arthroplasty
- CHAPTER 18** Posterior Cervical Fusion

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 by means of 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 intervertebral disc is made up of a soft, gel-like centre, called the nucleus pulposus, and this gel is contained by a tough outer fibrous ring-like structure arranged in layers, called the annulus fibrosus. The vertebrae of the spine are further kept in position by an array of ligaments. Muscles also attach to the vertebrae. Nerves leave the spinal canal, formed by the arches of the vertebrae, through small openings formed between the sides of the vertebrae, 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 spine to undergo wear and tear changes as it is stabilised by the rib cage that is attached to it. The cervical spine and the lumbar 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 bio-mechanical stress. The lower part of the cervical spine is therefore more prone to wear and tear.

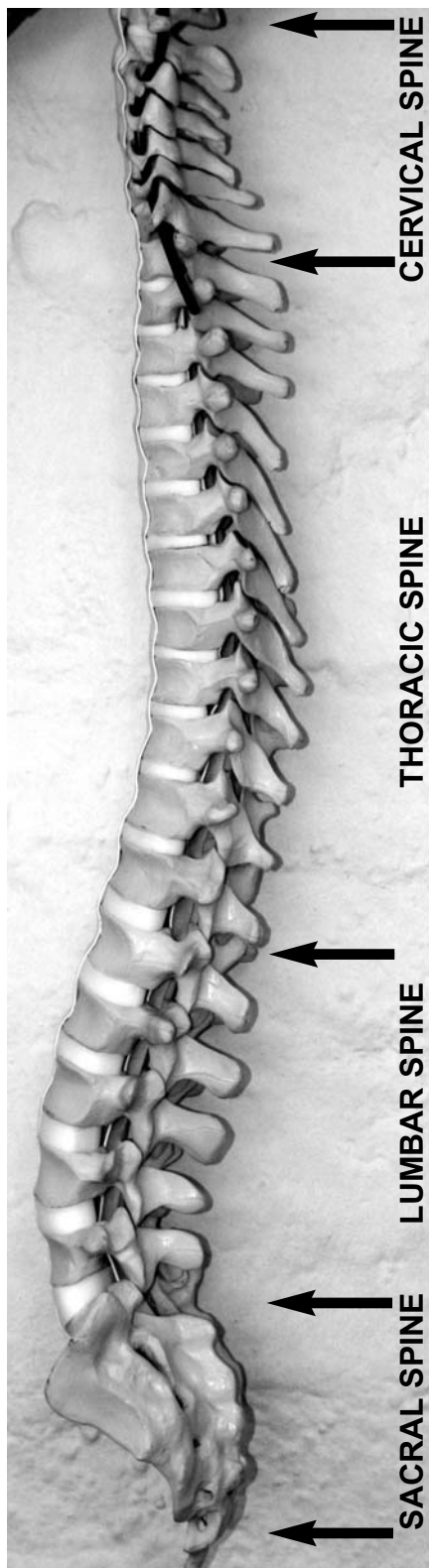


Figure 1.1

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 called 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 that acts as our central core.

An 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.

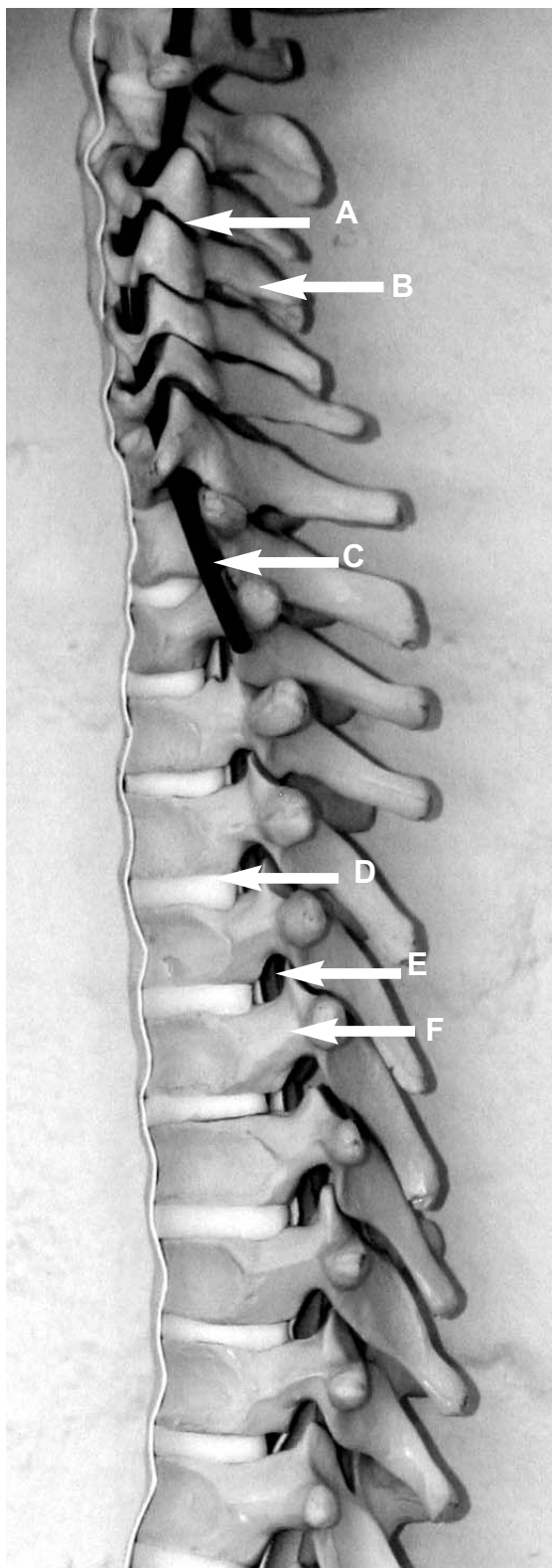


Figure 1.2

A: This is a joint in the cervical spine. These are the same joints that we find in the lumbar and thoracic spine. Their proper names are facet joints.

B: This is a cervical spinous process. Note how both the joints and the spinous processes are smaller than in the lumbar spine.

C: The black tube-like structure is the vertebral artery that runs through the side of the cervical vertebrae. This artery supplies the brain with blood.

D: This is a thoracic disc (intervertebral disc).

E: This shows the foramen through which the nerve runs to reach the chest wall.

F: This shows a pedicle, this is the bone that connects the back part of the vertebra with the body of the vertebra in the front.

My Spine - Cervical

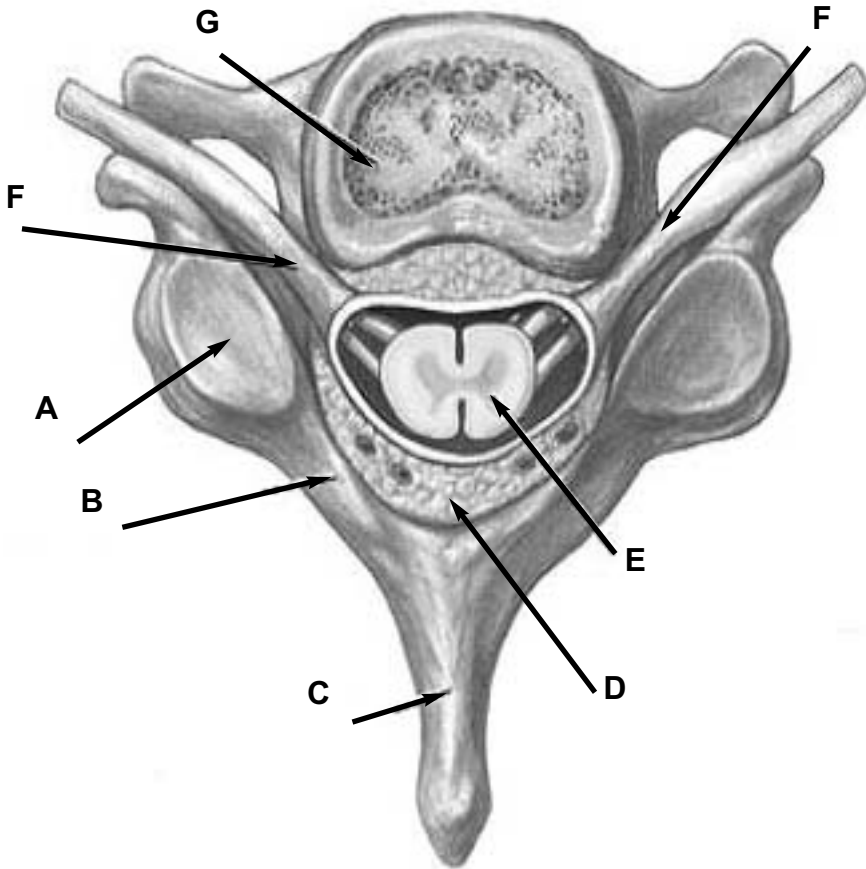


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Figure 1.3

This drawing demonstrates a cervical vertebra seen from above. (A) indicates the facet joint. (B) indicates the lamina which forms the back part of the spinal canal along with (C), the spinous process. (D) indicates the ligamentum flavum. (E) indicates the spinal cord and (F) indicates a nerve root in its foramen. (G) indicates the vertebral body which forms the front margin of the spinal canal and the intervertebral disc rests on top of it.

CHAPTER 2



NECK PAIN

Neck pain is a very common complaint among people of all age groups. It is, however, more commonplace among people in their thirties and onwards. Neck pain is mainly due to degenerative or wear and tear changes in the spine and is most often part of a progressive disease. It means that the underlying problem responsible for neck pain will slowly but surely get worse in time.

It is therefore of paramount importance that treatment focuses on supporting the structures of the neck and to prevent excessive stress on the spine.

There are three types of neck pain: mechanical neck pain, referred pain and radicular pain.

Mechanical neck 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 neck pain is, however, the joints between the vertebrae called the facet joints. This pain is typically increased by certain movements. Turning and bending the neck is uncomfortable and frequently associated with crunching sounds and a feeling of stiffness. It is often worse on the one side. It is frequently associated with referred pain.

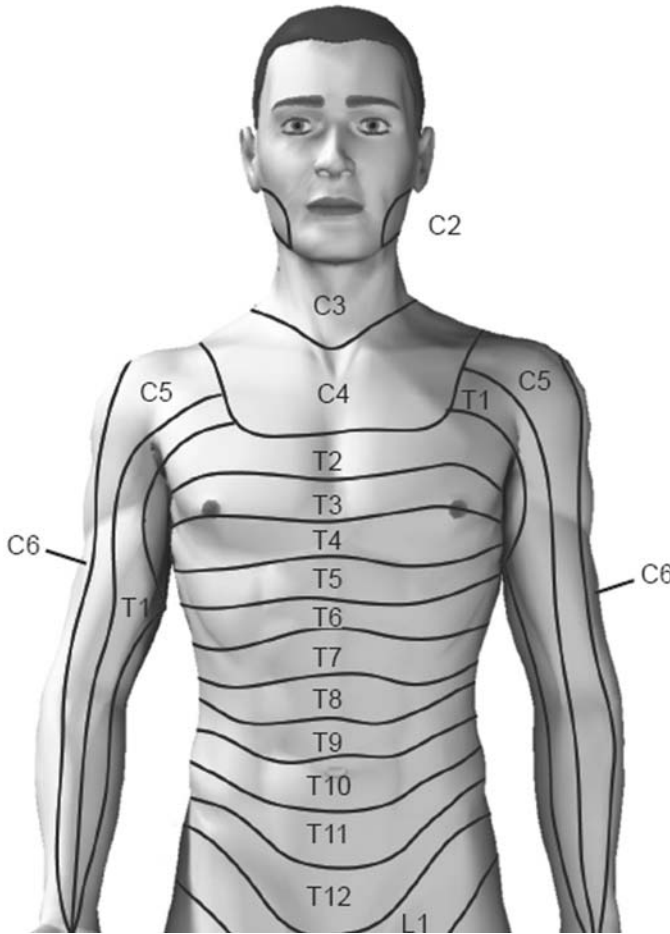


Figure 2.1 This image demonstrates the dermatomes.

Radicular pain is due to nerve compression. Dermatomes are skin maps that indicate which area of the skin is being supplied with sensation by a specific spinal nerve. This will allow your specialist to have a reasonable suspicion about which nerve is being compressed if you have radicular pain. The fifth cervical nerve root (leaving the spinal canal between the fourth and fifth cervical vertebrae), for instance, is called C5 and extends from the shoulder to the wrist on the inside of the arm, as demonstrated in the diagram. When there is compression of this nerve root, you will experience pain over the area supplied by that nerve.

Referred pain is not due to nerve compression and is a more vague and non-specific pain which spreads to the head, shoulders, between the shoulder blades and even behind the eyes.

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There are a great number of people suffering from mechanical neck pain who have associated headaches. This is most frequently caused by inflamed joints which in turn cause the muscles of the neck to go into spasm. These muscles are attached to the head and cause headaches by pulling on the head. This is the same way that stress headaches are caused. There are other causes of mechanical neck pain as well. The treatment of mechanical neck pain focuses mainly on treatment of the facet joints and the inflammation located in these joints as well as the effects of that inflammation, such as muscle spasm.

Medical treatment would include the use of anti-inflammatory medication, pain medication and muscle relaxants. Manual treatment would include pressure point therapy, massage therapy, physiotherapy and chiropractic therapy. Non-surgical management would include radiofrequency rhizotomies, local blocks and facet blocks. Mechanical neck pain that is associated with spinal instability may be treated by performing a posterior neck fusion.

Referred pain

This is pain that spreads from the inflamed tissue in the neck along nerves to other parts of the body. This would frequently be the head, shoulders, between the shoulder blades and even behind the eyes. This is directly associated with mechanical neck pain. It should not be confused with radicular pain.

Referred pain is a frequent cause of headaches. The nerves that supply the skin of the head come directly from the neck and pain can spread along these nerves. The treatment for referred pain is the same as for mechanical neck pain, since the cause is the same in both cases and based on inflammation of tissue.

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.

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When the nerve, for instance, between the fifth neck vertebra and the sixth neck vertebra is being pinched, the pain will be experienced at the thumb and index finger as this is where the nerve ends up. Both the physical compression of the nerve root and the inflammatory changes in and around the nerve root are responsible for the 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 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.

CHAPTER 3



CERVICAL 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 may tear, 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. This can be caused by a traumatic injury, but is usually due to an inborn predisposition towards weak discs. When a part of the nucleus pulposus pushes through (herniates) the annulus fibrosus it is called a slipped (herniated) disc.

My Spine - Cervical

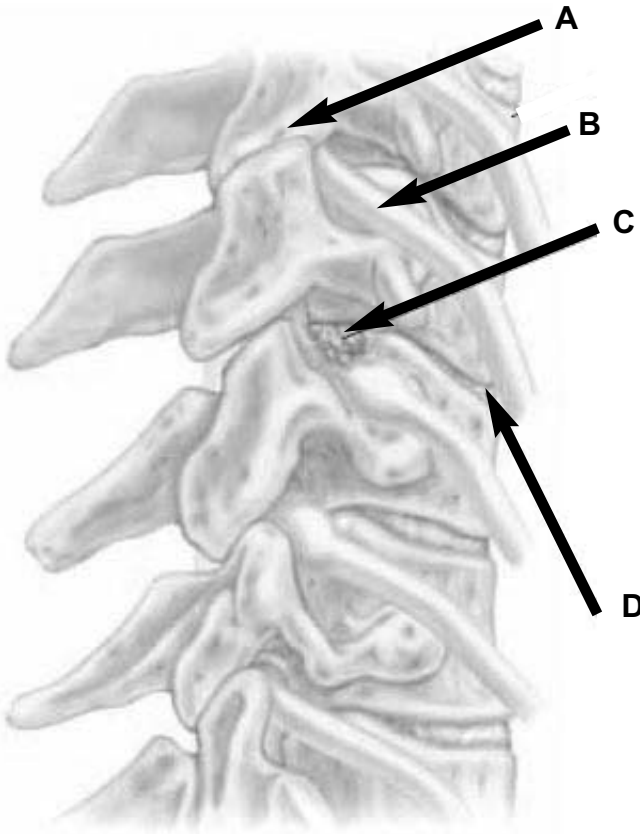


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Figure 3.1

This drawing illustrates a cervical nerve root that is being compressed by a disc prolapse. The facet joints (A) form the roof of the canal through which the nerve root (B) runs on its way to the arm.

The slipped disc (C) is pressing directly on a nerve root and this can cause pain, pins and needles and ultimately weakness in the arm. The intervertebral disc (D) acts as a shock absorber between the vertebrae.

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Compression of the spinal cord is very dangerous and can lead to paralysis. One of the earliest signs of impending paralysis is very brisk reflexes when the specialist taps your knee or elbow. Compression of a nerve root may lead to pins and needles, pain and weakness of that part of the arm and hand which is supplied by that specific nerve. See the description of dermatomes in the chapter *Neck Pain*.

What are the symptoms?

When the part of the nucleus that herniated compresses the nerves in the spinal canal, you may experience neck pain and pain in one or both arms. Some people experience pins and needles in the hands. Pain and discomfort may also be sensed in the shoulder, between the shoulder blades or at the front of the chest (thorax).

At a later stage, weakness in the arms and hands may be experienced.

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 contraindications 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*).

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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 - therefore in the absence of spasticity or muscle weakness. There is a certain proportion of patients who will get better without an operation within the first six to twelve weeks after onset of the first symptoms.

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

Semi-invasive treatment – These include procedures like radiofrequency rhizotomy (see the chapter *Cervical Radiofrequency Rhizotomy*) for the treatment of facet joint mediated mechanical neck pain and Nucleoplasty (see the chapter *Cervical Nucleoplasty*) for the treatment of discogenic pain. 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 cervical disc disease.

If conservative management is unsuccessful, then surgery is usually indicated. In situations where there is muscle loss or sensation loss due to a compressed nerve, surgery is considered much sooner. Compression that continues for too long can cause permanent nerve damage. The longer the duration of the symptoms, the smaller 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.

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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 neck pain, referred pain and radicular pain.
3. Muscle weakness due to nerve compression (radicular weakness).
4. Spasticity.

The most frequently performed operation is called an anterior cervical discectomy. Other operations that are performed include laminectomy and foraminotomy.

Does this treatment have any complications?

There are no real complications regarding conservative management of a cervical slipped disc beyond the fact that the clinical effects may increase, leading to surgery. The surgical management carries rare, but potentially serious complications. The chapter *Your Neck Operation* contains more specific detail and you should discuss this with your specialist. Some of the most feared risks would include nerve damage, which may be damage to the nerves leaving the spinal canal or damage to the spinal cord itself. The potential effects of this could be partial or complete dysfunction of these nerves and can include numbness, pain, weakness of the muscles or complete paralysis of one or more muscle groups. Infection and the formation of blood clots are also possible complications. Speech impediments can be caused by traction or damage to certain nerves.

What are the long-term expectations?

In cases where the symptoms settle with conservative measures, the symptoms may reappear at some stage. This can, however, take several years, but relief may be short lived. In cases where a discectomy and fusion are performed, the symptoms are usually relieved immediately in almost all patients and improvement is usually permanent.

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In patients where the nerves have been damaged permanently, the dysfunction of the nerves (numbness, pain and weakness) may not clear up; this is, however, rare. In patients where the operation successfully treated the symptoms, ongoing spinal degeneration may lead to pathology of the adjacent (or a distant) spinal level resulting in new symptoms appearing from nerve compression at that level and ultimately future surgery on that level.

This is believed to be a process that, even though part of the normal ageing process, is speeded up by surgery. This is believed to be less of a factor when a disc arthroplasty is performed instead of a fusion, see the chapter *Cervical Disc Arthroplasty*.

CHAPTER 4



CERVICAL SPONDYLOTIC MYELOPATHY

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 (see the chapter *Anatomy of the Spine*).

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. These discs also act as shock-absorbers and maintain height between the vertebrae. As we age the nucleus dehydrates and the height between the vertebrae diminishes. The body's response to this is the formation of bony ridges on the edge of the vertebrae, called osteophytes. These bony ridges (bone spurs) can cause compression of nerve roots and in the case of cervical spondylotic myelopathy, the spinal cord itself.

In other cases the tough annulus fibrosus of the disc may tear, 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. This can be caused by a traumatic injury, but is usually due to an inborn predisposition towards weak discs and is a degenerative disease.

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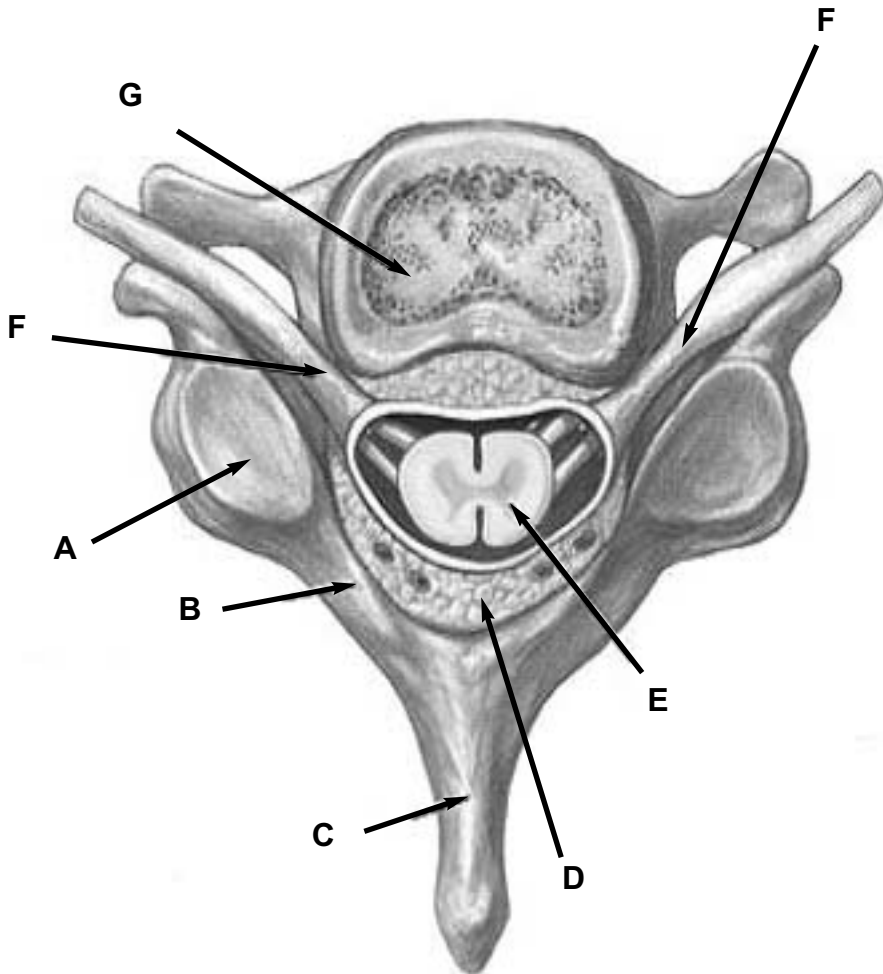


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Figure 4.1

This drawing demonstrates a cervical vertebra seen from above. (A) indicates the facet joint. (B) indicates the lamina which forms the back part of the spinal canal along with (C), the spinous process. (D) indicates the ligamentum flavum. (E) indicates the spinal cord and (F) indicates a nerve root in its foramen. (G) indicates the vertebral body which forms the front margin of the spinal canal and the intervertebral disc rests on top of it. Spinal stenosis occurs once there is narrowing of the canal (E) as a result of enlarged ligaments inside the canal, enlarged facet joints (A) and when the intervertebral discs that rest on the vertebral body (G) herniates (prolapses) backwards into the canal.

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At the same time the facet joints at the back of the neck can undergo osteoarthritic changes. The combination of loss of height and facet joint arthritis lead to an imbalance of the neck. At the same time the arthritic changes in the joints and abnormal alignment of the spine causes local nerve and muscle irritation which leads to muscle spasm and referred pain. The combination of enlarged facet joints, disc herniation, osteophytes and spinal ligament enlargement leads to narrowing of the spinal canal.

Cervical osteoarthritis and abnormal alignment is called cervical spondylosis. When the spinal canal is narrowed and the spinal cord is being compressed, it leads to dysfunction of the nerves of the spinal cord.

What are the symptoms?

Compression of nerve roots leaving the spinal canal causes pain in the arm(s), sensory abnormalities (feeling of pins and needles) in the arm(s) and weakness of the arm muscles supplied by those nerves. This is called a radiculopathy. The dysfunction of the spinal cord as a result of compression is called myelopathy. Myelopathy is a disease of the spinal cord that manifests as pain and weakness in the arms and also spasticity of the arms. The early manifestations can often be the inability to perform intricate tasks with the hands and fingers and stumbling when walking. It can also cause dysfunction of the nerves to the bladder and the bowel.

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 contraindications to doing an MRI scan or when technical factors such as the presence of certain metal fusion apparatus in the spine, make an MRI scan unreliable.

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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. Sometimes electromyograms (EMG) are also used (see the chapter *Tests and Scans*) and this test measures the electrical conduction in nerve roots and adds to other diagnostic tests.

How is it treated?

The clinical deterioration in myelopathy can usually not be reversed but only halted. This is only achieved by surgery. Mild improvement can occur, but is not guaranteed. The treatment consists of surgical decompression of the spinal cord and the nerves that arise from the spinal cord.

The operation can be from the front of the spine and these operations are called discectomies and corpectomies (see the chapter *Anterior Cervical Discectomy*) and are usually accompanied by an intervertebral fusion.

Sometimes the operation is done from the back and these operations are called a laminectomy and laminoplasty (see the chapter *Cervical Laminoplasty and Laminectomy*) and they may sometimes be accompanied by a posterior spinal fusion. A posterior cervical fusion (see the chapter *Posterior Cervical Fusion*) is performed if the surgery to decompress the nerves is so extensive that it leaves the spine unstable.

Does this treatment have any complications?

Managing this condition without surgery almost always leads to a progression in the symptoms of the patient. Should surgical treatment not be performed, the clinical symptoms can remain unchanged for long periods of time, but sudden deterioration can occur without warning. The surgical management carries rare, but potentially serious complications. The chapter *Your Neck Operation* contains more specific detail and you should discuss this with your specialist. Some of the most feared risks would include nerve damage, which may be damage to the nerves leaving the spinal canal or damage to the spinal cord itself.

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The potential effects of this could be partial or complete dysfunction of these nerves and can include numbness, pain and weakness of the muscles or complete paralysis of one or more muscle groups. Infection and the formation of blood clots are also possible complications. Speech impediments can be caused by traction or damage to certain nerves.

What are the long-term expectations?

In cases where the symptoms improve with decompressive surgery, the symptoms may reappear at some stage. In patients where the nerves have been damaged permanently, the dysfunction of the nerves (numbness, pain and weakness) may not clear up.

In patients where the operation successfully treated the symptoms, ongoing spinal degeneration may lead to pathology of the adjacent (or a distant) spinal level resulting in future surgery on that level. This is believed to be a process that, even though part of the normal ageing process, is speeded up by surgery.

CHAPTER 5



WHIPLASH INJURIES

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. See the chapter *Anatomy of the Spine*.

This injury is caused when the neck is forcefully jerked backward and then forward. When the neck is forcefully flexed forward, the movement is stopped by the chin hitting the chest. There is, however, no barrier to stop the neck from going backward and the main function of headrests in cars is to limit this movement. When the neck is suddenly and forcefully jerked, for instance during a motor vehicle accident where the car is hit from behind, there is tremendous strain on the tissues of the neck. The muscles, tendons, vertebrae, discs and joints can be damaged.

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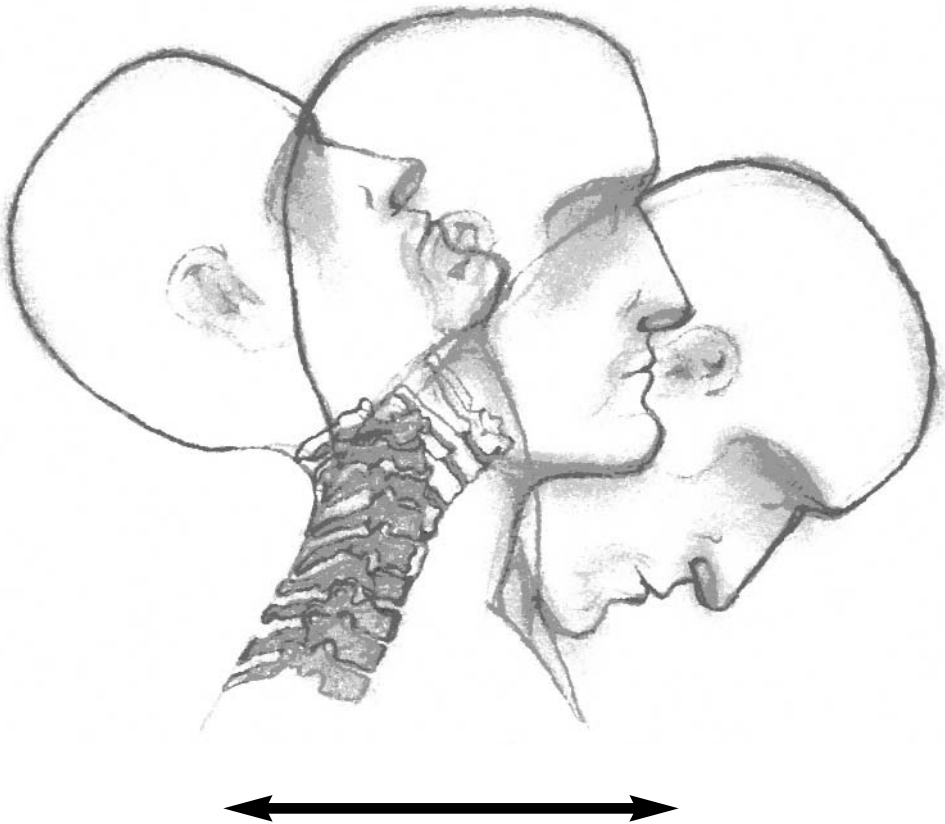


Figure 5.1

This diagram illustrates a whiplash injury. Note how the neck is overextended and then hyperflexed. Especially the extension injury damages the facet joints of the neck. The disrupted joint surfaces become inflamed and can lead to arthritic changes.

The ligaments, muscles, nerves and other soft tissue can also be damaged by the tremendous strain placed on them during a whiplash injury. The intervertebral discs can also be damaged and lead to neck pain and stiffness. If the disc tears, it may press against a nerve root or even the spinal cord leading to nerve irritation or damage. This can lead to arm pain, pins and needles and even weakness of muscles.

My Spine - Cervical

What are the symptoms?

The muscles that tear can trap nerves in the scar tissue that forms during the healing process of the torn muscles and this can cause chronic headaches and neck pain. However, the main cause for neck pain is the damage that the joints suffer. The damage to these joints cause ongoing mechanical neck pain and referred pain. Sometimes symptoms appear over a period of time after the accident took place.

Damage to the facet joints between the second and third cervical vertebrae can cause referred headaches. Damage to the joints between the fifth and sixth vertebrae are usually responsible for neck pain, arm pain and pain between the shoulder blades. Cervical facet joint pain is typically a unilateral (one-sided), dull and aching neck pain with referral into the back of the neck and between the shoulder blades.

Shortly after the accident, neck pain may be minimal with an onset of symptoms during the subsequent 12 – 72 hours. If the damage also caused disruption of the intervertebral disc, then there could be compression of a nerve root and radicular pain (nerve root pain) that may extend down the whole length of the arm.

Some patients experience dizziness which may result from injury to facet joints that are supplied with balance nerves which can cause confused feedback to the midbrain and brainstem, where balance is controlled.

There is a grading system that is used to define the seriousness of the injury.

Grade 0 – No neck pain complaints, no physical signs.

Grade 1 – Neck pain complaints, stiffness and/or tenderness, but no other physical signs.

Grade 2 – Neck pain complaints and musculoskeletal signs (decreased range of motion and point tenderness).

Grade 3 – Neck pain complaints and neurologic signs (weakness, sensory and reflex changes).

Grade 4 – Neck pain complaints with fracture and/or dislocation.

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How is it diagnosed?

A clinical examination by your specialist or therapist will allow for a reasonable suspicion, but a CT scan and radio isotope scan (see the chapter *Tests and Scans*) will help make the diagnosis. The CT scan will give information about the anatomy of the joints and the radio isotope scan will reveal any inflammation in the joints. Tests can, however, only give an indication and should be interpreted along with the clinical picture.

How is it treated?

The available treatment includes anti-inflammatory medication, analgesics, physiotherapy and other manual treatments such as chiropractic treatment, pressure point therapy, massage therapy, traction and other therapies. Rhizotomies can be very successful in the management of whiplash injuries (see the chapter *Cervical Radiofrequency Rhizotomy*).

Does this treatment have any complications?

The only real complication is the fact that this condition is difficult to treat and treatment is not always successful. There have been reports that overzealous chiropractic treatment of the neck can have complications, but modern chiropractic techniques are much better tolerated.

What are the long-term expectations?

In cases where the symptoms settle with conservative measures, the symptoms may reappear at some stage. This is a condition with ongoing morbidity and treatment has to be ongoing. In some cases symptoms are resistant to all treatment, and this can be a challenging situation to manage.

CHAPTER 6



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 following administration of a contrast medium 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 like 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 the spine. It is not as efficient when evaluating the softer tissues such as discs, ligaments and nerves as MRI scans, which 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.

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Figure 6.1

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 different types of body tissue.

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 types of body tissue 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.

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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 converts them into images. These images are high resolution images and all the tissues in the body can be seen in significant 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 or devices 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 anatomy 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 from 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.

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Figure 6.2

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.

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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 served 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.

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Figure 6.3

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. 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 - Cervical

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 usual spinal discomfort 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 cervical region for CT scans and MRI scans

Spinal stenosis and cervical spondylosis – 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 degenerative 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).

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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 neck pain, referred pain and even radiculopathy (see the chapter *Cervical 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 *Cervical 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 arm. 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. Large central disc herniations can damage the spinal cord and cause myelopathy (spasticity) secondary to spinal cord damage.

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Flattening of the spinal cord – 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 spinal cord.

Nerve root – This is the nerve root that leaves the spinal cord and exit the spine through the intervertebral foramen. Most of the exiting nerve roots can be seen side-on in the axial planes and in 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 one 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 of spondylolisthesis and is the process where the bone supporting the facet joints is weak and fractured.

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.

CHAPTER 7



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 neck pain and misinformation is much more dangerous than no information. Other patients will also frequently have preconceptions and misconceptions about the nature of neck 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.

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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 8



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.

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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.

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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 8.1 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.

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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.

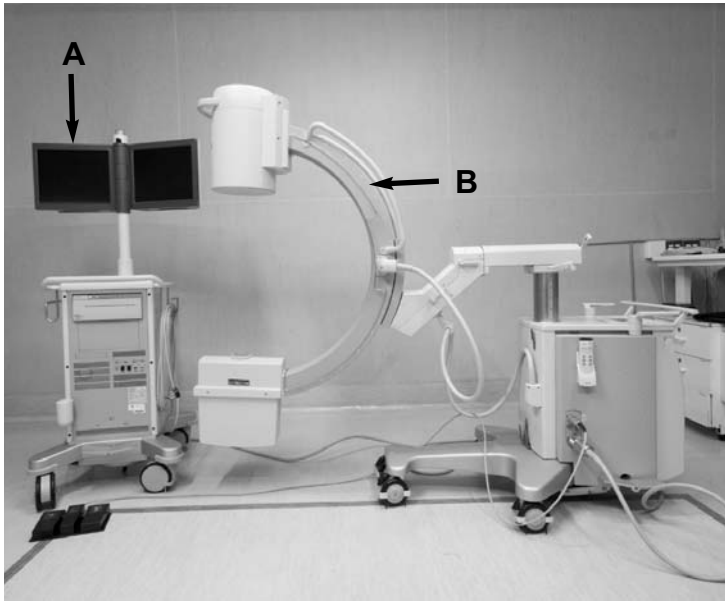


Figure 8.2 The mobile X-ray machine (fluoroscopy unit)

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 - Cervical

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.

The machine has an extensive monitoring function to perform and 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.

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 8.3 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.

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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 - Cervical



Figure 8.4

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 - Cervical

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 9



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 - Cervical

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 - Cervical

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.

My Spine - Cervical

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 - Cervical

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 neck 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 - Cervical

Am I going to have a lot of pain afterwards?

Certain neck 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 neck 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 - Cervical

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 - Cervical

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 10



YOUR NECK OPERATION

You have agreed to surgery for your neck 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.

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Please notify the staff if you have had any cardiac surgery, previous unnatural reactions to medications, have a pace maker, are a diabetic, have allergies or suffer from any infective diseases. 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 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 a drip up 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 the sensation 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 regarding procedures and operations for technical data about the operation that your specialist is suggesting.

My Spine - Cervical

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.

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. 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; 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 prescribed analgesics for post-operative pain.

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.

My Spine - Cervical

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.*

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 will be necessary to drain this blood clot with a minor surgical procedure. If the clot becomes too large, it may compress the breathing tube (trachea), leading to breathing difficulties.*

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 bigger it may compress important structures like nerves and can lead to nerve dysfunction. The specialist, however, will inspect the wound carefully before the wound is closed and even the smallest bleeding point is stopped.

My Spine - Cervical

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, however, a very rare complication.*

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 against 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.*

My Spine - Cervical

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. Because of modern techniques this risk is now less than 1/10 000.*

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: *There is a risk that you may have a painful throat and find it difficult to swallow after your operation. It is also possible that you may be hoarse.*

Explanation: During anterior cervical (neck) surgery the dissection of tissues as well as retraction of these tissues to allow visualisation of the vertebrae and the intervertebral discs, may cause irritation of the swallowing tube (oesophagus), which may lead to difficulty in swallowing. Retraction of the speech nerve (recurrent laryngeal nerve) may lead to hoarseness. This is usually temporary, but in severe cases, it may be permanent.

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

Explanation: Instrumentation and prosthesis used in neck 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.

My Spine - Cervical

Risk: *It is possible that fusing a segment of the cervical 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 *Cervical Disc Arthroplasty*).

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

Explanation: Both the anterior (from the front) and the posterior (from the back) surgical approaches to neck surgery involve close proximity to the great blood vessels that supply and drain the blood from the brain. It is possible that these vessels may be damaged, or a atherosclerotic clot loosened that may compromise the blood supply to the brain. 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.

Risk: *It is possible that the breathing tube (trachea) may be damaged in anterior cervical surgery.*

Explanation: The trachea is in the surgical field in anterior cervical surgery and may be inadvertently damaged. This can be repaired if recognised, but may cause thoracic cavity complications if it is unrecognised.

My Spine - Cervical

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 11



CERVICAL 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 chapter called *Your Neck Operation*).

A cervical 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 block the pain impulse from travelling up the nerve to the brain. This will then bring partial or complete (but 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 arm 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 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.

My Spine - Cervical

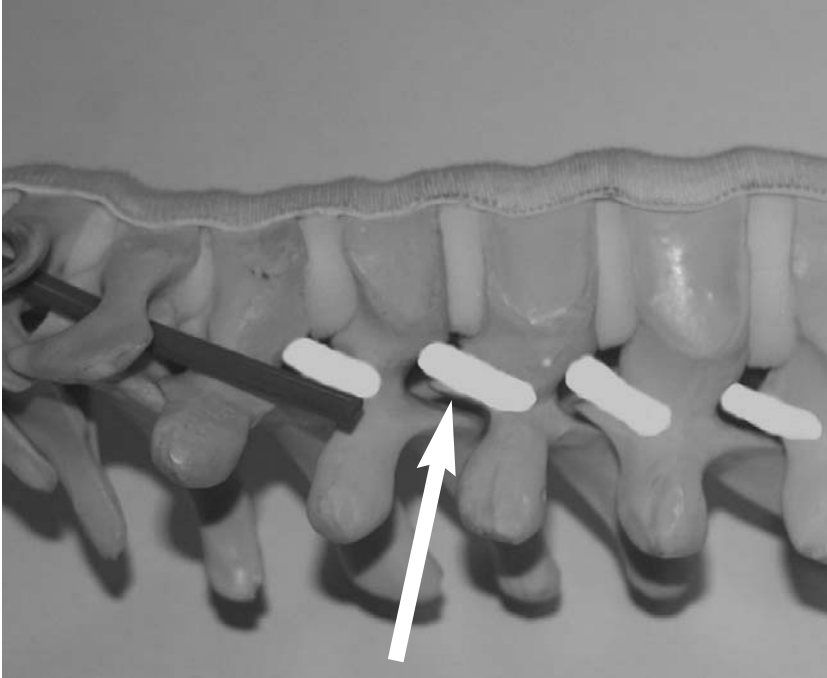


Figure 11.1

This illustration demonstrates a cervical nerve root – arrow – and the arrow also depicts one of the approaches in doing a cervical nerve root block. A needle is used under X-ray guidance to find the foramen through which the nerve root runs and a mixture of local anaesthetic and steroids are injected into the foramen.

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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 or on your back 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 experience a bit of discomfort directly following 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 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 - Cervical

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 that you realise that you will have to protect your neck for the rest of your life.

CHAPTER 12



CERVICAL 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 Neck Operation*).

A cervical RFR is performed for pain that is caused by damaged facet joints (see the chapter *Anatomy of the Spine*). 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 temporary) relief of the pain, spasms 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. Some specialists perform this procedure with their patients lying on their back. Your specialist will use an X-ray machine to guide the needles that are used to do the procedure with.

In performing the rhizotomy, thin needles are inserted through the skin at the back of the neck. These needles are placed on the small nerves that supply the joints between the two vertebral bodies and a radiofrequency generator is then attached and the nerve is inactivated by radiofrequency pulses.

My Spine - Cervical

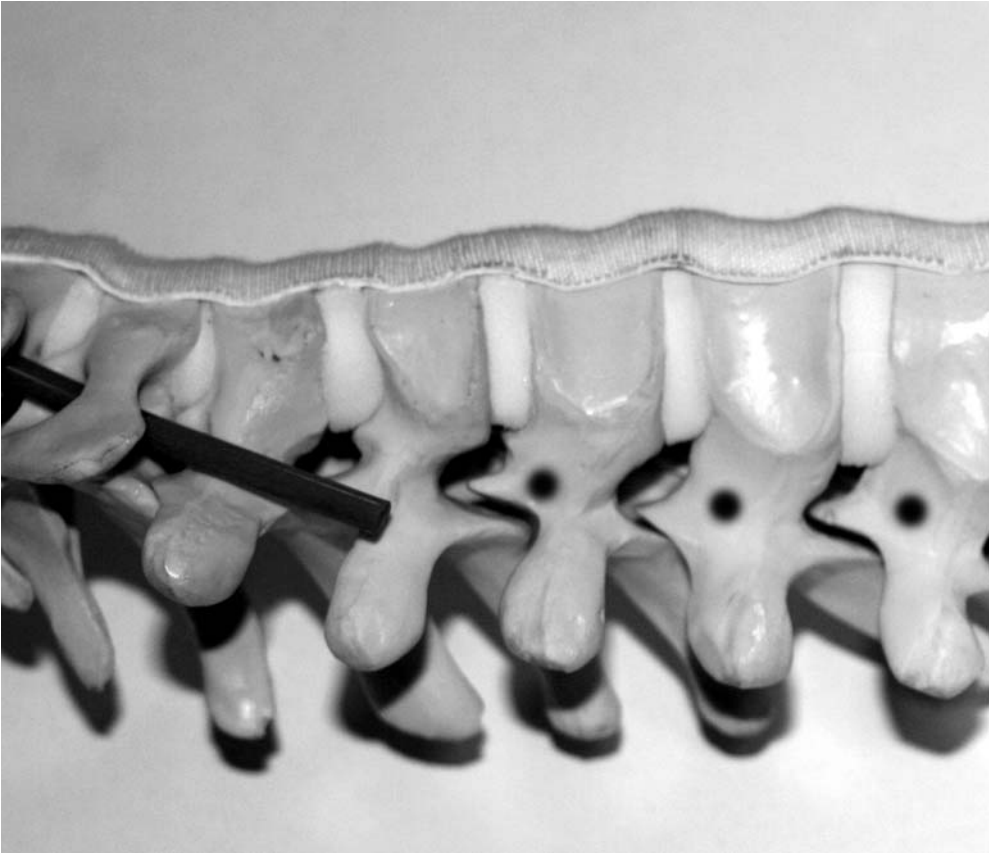


Figure 12.1

This is a photo of the side of a cervical spine. Note the black spots that indicate the area where the needles are placed to inactivate the nerves that supply the joint with pain sensation.

The needles are placed with the aid of an X-ray machine and a radiofrequency current is passed through an electrode that is fitted into the needles. This is a relatively safe procedure. Pulsed radiofrequency is a safer procedure than conventional radiofrequency procedures. Pulsed radiofrequency stuns the nerve whereas conventional radiofrequency treatment is based on temperature mediated damage of the nerve.

My Spine - Cervical

These are not majorly important nerves and it is not dangerous to inactivate them with radiofrequency pulses. When inactivated, these nerves cannot conduct pain sensations 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 will have to be repeated when the pain returns.

The treatment can either be a pulsed radiofrequency procedure, where the nerve is inactivated by pulses of radiofrequency current or it can be a thermal lesion where the nerve is damaged by heat generated by the radiofrequency current. Thermal lesions last longer, but may have more complications than pulsed procedures.

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 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.

My Spine - Cervical

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 neck for the rest of your life and apply good neck habits.

CHAPTER 13



CERVICAL 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 Neck Operation*).

A cervical Nucleoplasty is performed for pain that is caused by damaged intervertebral discs. The aim of the procedure is to reduce 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 rhizotomies, 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 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 back 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 - Cervical

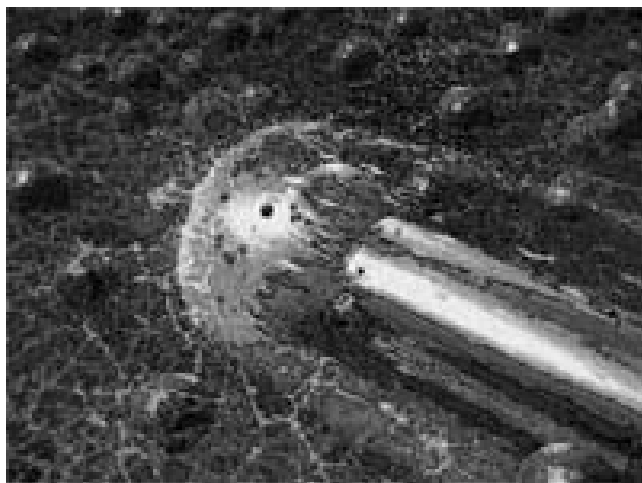


Image used with permission from ArthroCare

Figure 13.1

This illustration demonstrates coblation therapy that is used in Nucleoplasty to “dissolve” tissue. This technology allows tissue to be removed without damaging nearby sensitive tissue.

My Spine - Cervical

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 neck the rest of your life and apply good neck habits. It is important to appreciate that the efficacy and longevity of this treatment is still under investigation.

CHAPTER 14



CERVICAL LAMINOPLASTY AND LAMINECTOMY

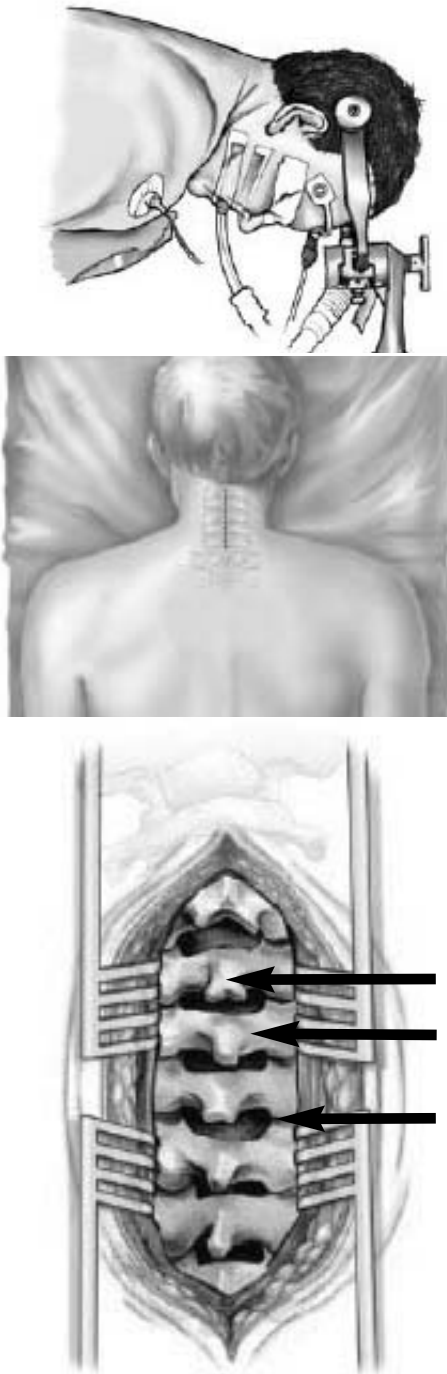
(This is the section that explains the detail of the operation or procedure above and should be read in conjunction with the chapter *Your Neck Operation*).

A decompression of the spinal canal, that carries the spinal cord, is carried out because of compression of nerves by a variety of pathological mechanisms. This can range from degenerative changes in the spine to growths, tumours and traumatic compression following an accident. The rule in general is that when the spinal cord is being compressed from the front, the operation is performed from the front of the neck (anterior) and when the compression is from structures located in the back of the vertebral column, then the procedure is carried out from the back (posterior).

In cases of posterior cervical decompression, the nerves are being compressed by structures at the back of the spinal canal. The laminae (see the chapter *Anatomy of the Spine*) are the doorway to the spinal canal and they are removed in a laminectomy and partially removed and fixed partially back in a laminoplasty. Please see the pictures on the next page for a step-by-step explanation of how a laminectomy and laminoplasty are performed.

In cases where the decompression is over several levels or where the decompression is thought to cause instability, a posterior cervical fusion may be performed (see the chapter *Posterior Cervical Fusion*).

Figure 14.1



These drawings demonstrate the positioning of a patient for posterior (from behind) cervical surgery. The top picture shows the patient lying on his stomach and his head fixed in a Mayfield clamp. This allows the neck to be flexed during the operation. This is important as the skin folds of the neck make it difficult to operate in the neck area.

The drawing in the middle demonstrates the area of the skin incision. This will vary in length, depending on how many spinal levels are involved in the surgery.

*The bottom picture demonstrates what it looks like when the skin incision has been performed and the specialist has dissected through the muscles to the vertebrae of the spine. Note how the wound is being kept open with a self-retaining retractor. The spinous processes (A), laminae (B) and intervertebral joints (C) are exposed (see the chapter *Anatomy of the Spine*).*

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My Spine - Cervical

At the end of the procedure, a drainage pipe will be placed in the wound and connected to a reservoir. 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. Thereafter you will be taken to the ward. You may mobilise after the operation as soon as your specialist allows this and will usually be from the day following your operation. The hospital staff will administer prescribed analgesics for any post-operative pain.

Ward care

In the ward you may mobilise as prescribed by your specialist. You may be required to wear a neck collar to keep the spine stable in the direct post-operative period and you may be obliged to wear it for six weeks or more.

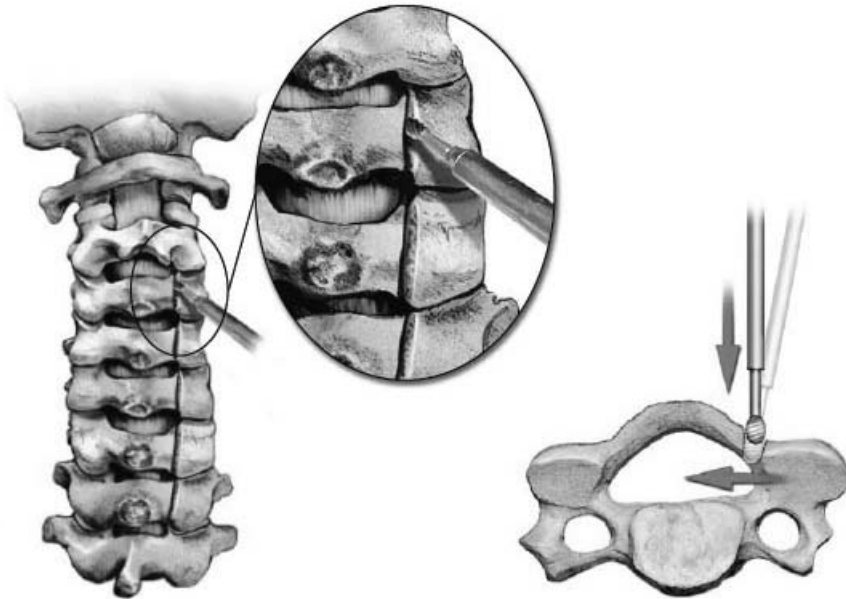
You will usually be seen by the physiotherapist who will demonstrate the appropriate neck exercises. The drainage pipe in your neck will most probably be removed on the day after the operation.

Discharge

You would normally be discharged within the week following surgery with analgesics to take home. The back of your neck is often very tender and can be very painful as the operation involves the stripping of the large muscles of the neck from the vertebrae. This is typically a painful healing process and can be uncomfortable for up to several months.

It is not uncommon for your neck to be stiff during this period. Wound care will be discussed with you by the hospital staff or your specialist and can be difficult in this area as there are skinfolds and a lot of stretching of the skin that can cause stress on the wound and on its healing process.

My Spine - Cervical



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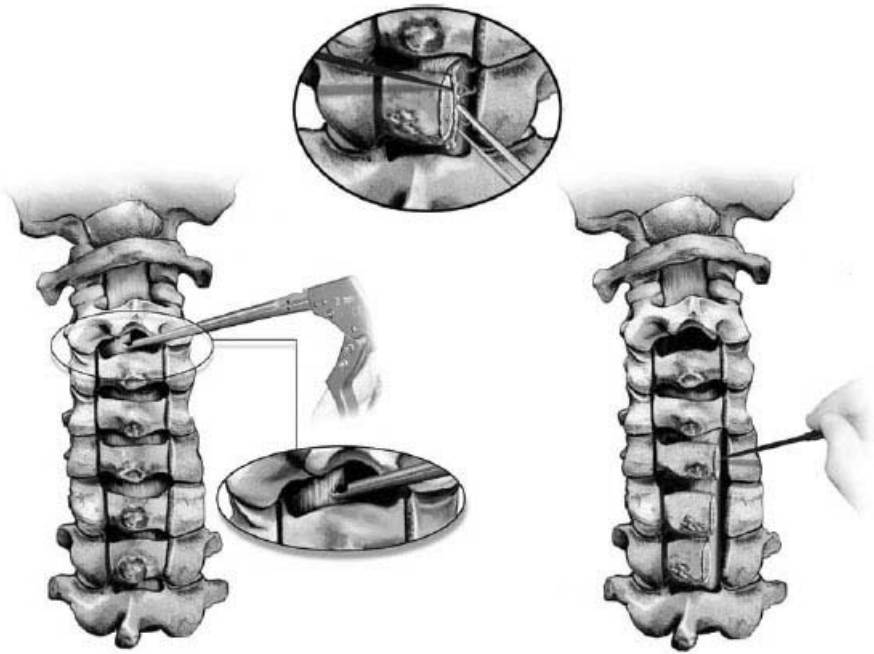
Figure 14.2

These drawings demonstrate the initial steps in performing a laminoplasty. A laminectomy can be performed in a similar fashion, but is usually performed slightly differently in that the spinous processes and the laminae are removed with a combination of instruments, leaving the spinal cord completely open. In a laminoplasty the laminae are loosened and fixed in a position to allow the underlying spinal cord freedom.

The reason why the laminae and the spinous processes are retained, is because it allows the spine to remain relatively stable. One of the complications of a laminectomy is that if you remove too much of the bone, the spine may become unstable and necessitate fusion with screws and plates or rods and bone donation.

In performing a laminoplasty, the laminae on the one side are separated from the vertebrae by drilling a groove all along the one side, as demonstrated above. This is called an open door laminoplasty. Sometimes the groove is made through the spinous process and the laminae is wedged open in the middle, and this is called a French door laminoplasty.

My Spine - Cervical



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Figure 14.3

These drawings demonstrate the rest of the procedure of a laminoplasty. A groove that extends through the whole of the thickness of the laminae, has been performed on the one side and on the other side the laminae has also been grooved, but not through the full thickness of the laminae. This allows the laminae to be wedged open. The ligament that lies underneath the laminae, between the laminae and the spinal cord, is called the ligamentum flavum and this is removed by an instrument called a rongeur.

A probe is used to wedge the side on which the laminae has been grooved, open. The whole idea is that this will then be kept open by small plates. This is called an open door laminoplasty. Sometimes the groove is made through the spinous process and the laminae is wedged open in the middle, and this is called a French door laminoplasty.

My Spine - Cervical



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Figure 14.4

This drawing demonstrates the final stage with the laminae being wedged open and kept open by screws and plates. This allows the spinal cord room and also does not compromise the stability of the spinal cord.

My Spine - Cervical

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 normal activities and wear a neck brace if your specialist prescribes it. You should refrain from exercises that involve impact for 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. You would usually undergo an X-ray of your neck a few months after the operation to evaluate the alignment of the spine and to see whether instability has occurred following the operation.

It is important to realise that you will have to protect your neck for the rest of your life and apply good neck habits.

CHAPTER 15



CERVICAL FORAMINOTOMY

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

A foraminotomy is an operation performed to relieve pressure on a spinal nerve as it exits the spine through an opening called the foramen. When this operation is performed in the neck region, it is called a cervical foraminotomy.

Typically this would be performed to relieve pain, numbness or tingling and possibly weakness in the arm. The nerve that is trapped and compressed determines the precise distribution of the symptoms in the arm. The compression may be caused by bone spurs called osteophytes or by protruding disc material. Whatever the cause, a foraminotomy is indicated when the offending structure causing the compression is located laterally (to the side of the spinal cord). In cases where the pressure is more towards the midline, a procedure called anterior cervical discectomy is more appropriate.

A cervical foraminotomy operation requires general anaesthesia. You will be carefully positioned for the duration of the procedure and some specialists use an approach where the patient is slouched in a semi-sitting position, while others prefer that the patient lie on their stomach. The specialist will then clean and prepare the back of the neck and make an incision in the skin at the appropriate level where compression of the nerve is present.

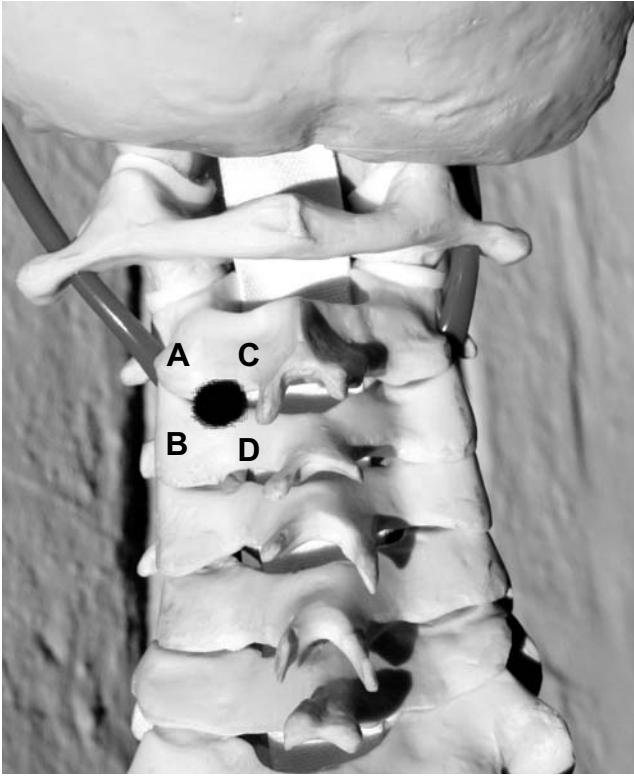


Figure 15.1 Anatomical position of a cervical foraminotomy

This is the anatomical position of the key hole that has to be drilled to allow access to the nerve as it is leaving the spinal canal. A part of the top half of the joint (A) and part of the bottom half of the joint (B) is drilled away along with a bit of the top lamina (C) and the bottom lamina (D) (see the chapter Anatomy of the Spine).

This is described as a left-sided C2/3 foraminotomy, because the nerve between the second and third cervical vertebrae is being decompressed. The third cervical nerve root leaves the spinal canal between these vertebrae. The nerve runs directly below this area and the intervertebral disc is directly below the nerve. The nerve root can be decompressed with this approach and disc fragments can be removed.

My Spine - Cervical

The length of the incision depends on various factors such as patient size, number of spinal levels involved and your specialist's preference. The length of the incision is actually of little consequence with regards to the success of the operation. The amount of soft tissue dissection does, however, dictate the amount of post operative pain.

The specialist can follow a midline approach, which actually means that no muscles have to be cut into. This would require a large cut to expose the side of the neck where the decompression has to be performed and is used when multiple spinal levels have to be decompressed. Another approach is to make a small incision directly over the point where the decompression has to be done (see Figure 15.1), and this approach is preferred if there is only one or two nerves that are being compressed.

The muscles are displaced to the sides and the lamina of the vertebra exposed – this is the flattened part of the back of the vertebra (see the chapter *Anatomy of the Spine*). An X-ray is taken to confirm the correct level and the decompression of the nerve is started. This is normally done by using a fine drill to make a keyhole shaped opening in the bone overlying the nerve.

If there is any disc material compressing the nerve, this may now be removed. Afterwards the wound is closed in layers using sutures and covered with a dressing.

Ward care

You may get out of bed soon after this operation, usually on the first day. You may move around freely, because the spine is not destabilised by this operation. Some specialists may prescribe a soft collar for comfort. Analgesics are normally prescribed for post-operative pain.

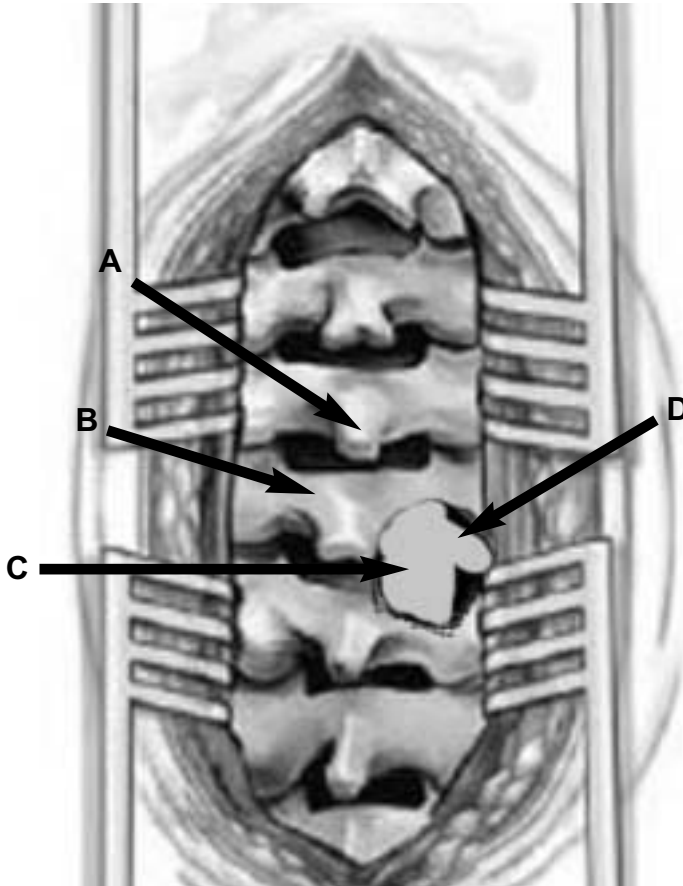


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Figure 15.2 Surgical technique of a cervical foraminotomy

This drawing demonstrates the key hole that has been drilled in the anatomical location depicted at another level on the opposite side of the spine in figure 15.1. Note how the skin and muscles are being kept open by self-retaining retractors and how the spinous processes (A) of the vertebrae and the laminae (B) are visible through the surgical incision. The spinal cord (C) and the nerve root (D) are visible through the key hole that has already been drilled (the keyhole demonstrated is larger than in real life for illustrative purposes). Loose fragments of intervertebral disc may be removed from underneath the nerve root.

My Spine - Cervical

Discharge

You would normally stay in hospital for two to three days following this operation and you should have rapid relief of the symptoms in your arms. Your specialist will prescribe analgesics to take home and will arrange for a follow-up visit. A sick leave-certificate will be provided if needed.

Rehabilitation

You should allow yourself two to three weeks for recovery before returning to work. Allow eight weeks for proper wound healing before returning to strenuous activity or sport. Your specialist could prescribe physiotherapy if you had symptoms of arm weakness before the operation.

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 neck for the rest of your life and apply good neck habits.

CHAPTER 16



ANTERIOR CERVICAL DISCECTOMY (ACD)

(WITH OR WITHOUT CORPECTOMY OR FUSION)

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

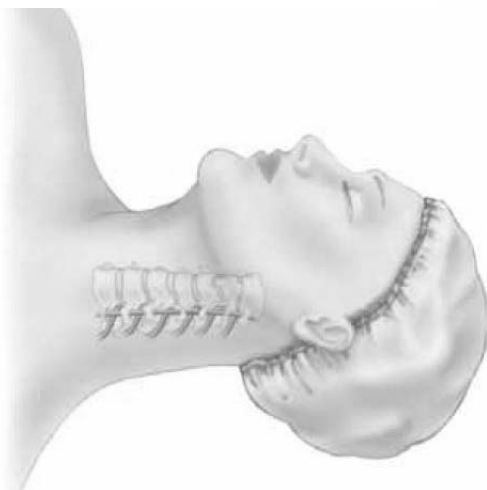
An anterior cervical discectomy (ACD) is an operation that is performed for a herniated cervical intervertebral disc (slipped disc) which is causing pressure on the related nerves or the spinal cord. The aim of the operation, which is performed from the front of the neck, is to remove this pressure by taking away the disc, the disc prolapse and any bony outgrowths/osteophytes that may be present. In some cases several discs need to be removed. At times even one or two vertebral bodies need to be removed to free the nerves and spinal cord. This latter operation is called a corpectomy (corpus is the Latin for body of the vertebra).

These operations usually require that the discs and vertebrae that are removed be replaced eventually by bone. Bridging a gap like this with bone is called an anterior cervical disc removal and fusion (ACDF). To enhance the likelihood and the speed of fusion and for the maintenance of the normal height of the disc space and the normal alignment of the neck vertebrae, the space is filled mostly with the patient's own bone or bone from a bone bank. A spacer made of metal or plastic is often used as a receptacle for the bone.

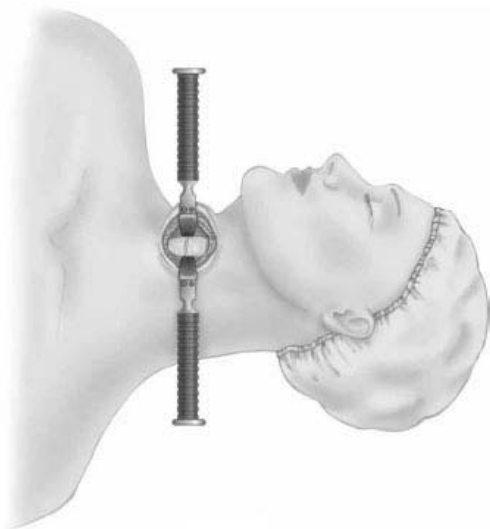


Figure 16.1

In the top picture a patient is positioned in the standard way for an anterior cervical discectomy. The machine in the picture is called a fluoroscopy machine and takes X-rays of the neck so that the specialist can constantly monitor the operation. There is a soft ring for the head to rest on. A bolster or small cushion is placed under the neck and shoulder blades to stabilise and also to extend the neck in order to slightly open up the discs in the front. This facilitates removal of the disc.



The second drawing shows the anatomical location of the bony spine in the neck.



The third drawing shows that the specialist has made the incision and has dissected down to the spine. The space is held open with hand held retractors. Note how you can see the vertebrae and the discs.

In the next set of drawings we will see the introduction of retractors that stay open on their own and allow the specialist and assistant to use their hands freely.

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My Spine - Cervical

The patient's own bone is regarded as the gold-standard for this purpose. However, this procedure requires an additional incision over the front of the pelvic bone near the hip, with extra pain involved, to harvest the bone.

In some younger patients, after a simple disc removal, the space that is created is simply left open to heal by itself. Scar tissue and bone will form in the space and with time, the two vertebrae will usually grow together, forming a spontaneous fusion.

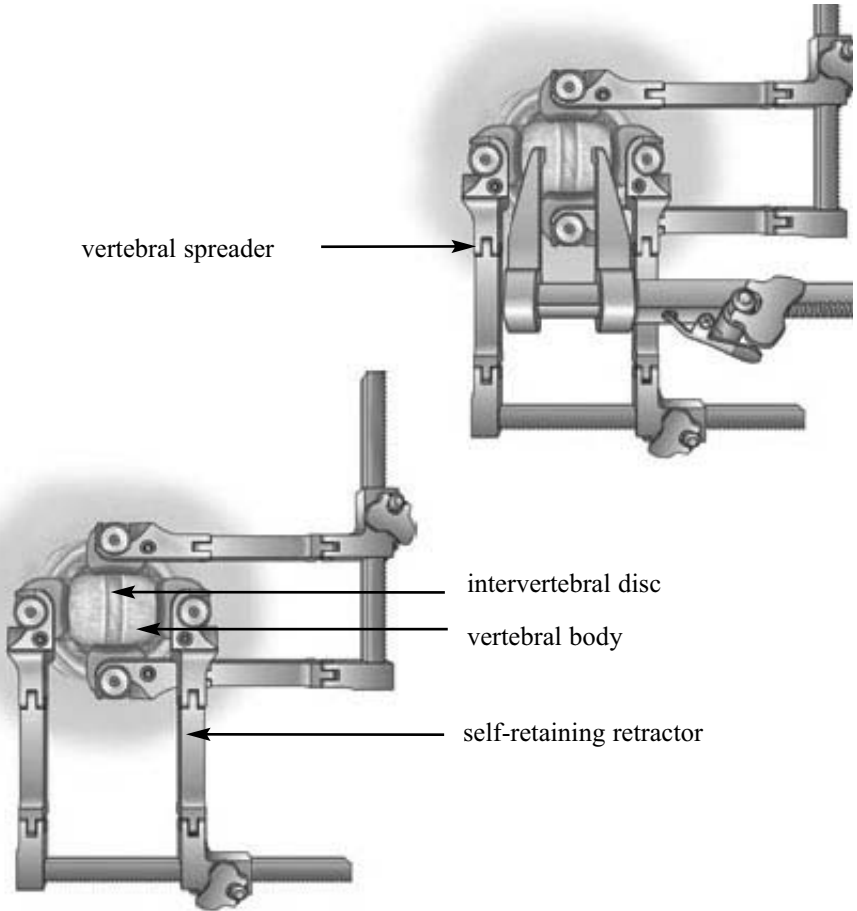
A newer technique is to replace the disc that has been removed by an artificial disc whereby movement in the neck is preserved at the level of the operation. This retained movement is thought to protect the adjacent discs from early degeneration of one or several discs, by avoiding the biomechanical stresses that are placed on the other discs of the neck by the fusion. There are specific indications for this procedure and the long-term results are only now becoming known and appear quite promising. See the chapter *Cervical Disc Arthroplasty*.

Some progress on the less invasive surgery front has been made by endoscopic surgery and percutaneous Nucleoplasty. Enquire from your specialist whether these would be an option for you. You may also want to consult a specialist that is proficient in these techniques as well as the usual open surgery techniques.

When undergoing the normal operation, you will be lying on your back and the specialist will be operating from the front. Your skin will be sterilised over the front of your neck with a combination of iodine and an alcohol solution and then the area will be covered with sterile drapes. A small incision will be made either transversely or obliquely in the front of your neck and the tissues will be carefully separated until the front of the spine is reached.

With the use of a microscope the damaged disc will be removed. In most cases a fusion will be performed by placing a bone block, or an artificial spacer containing bone, into the space where the disc has been removed.

My Spine - Cervical



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Figure 16.2

This drawing demonstrates the use of self-retaining retractors. These retractors have a ratchet mechanism that stays open, allowing the specialist to use his hands freely during the operation. The top drawing demonstrates the vertebral spreaders that pull open the disc space a bit by spreading the vertebrae from each other. This makes it easier to remove the disc. There are surgeons who do not use this technique, but use different ways of spreading the wound and the disc space.

My Spine - Cervical

Prior to closing the wound, a drainage pipe will be placed in the wound and connected to a reservoir. This will allow all excess blood to drain away and not cause a blood clot next to the breathing tube, which can be quite dangerous.

After the operation, you will be taken to the recovery room to recover from your anaesthetic. Afterwards you will be monitored for several more hours to ensure that no blood clots form under the skin of your neck or on the spinal cord. You may mobilise after the operation and the nursing staff will administer analgesia for any discomfort that you may experience.

Ward care

The drainage pipe in your neck will usually be removed on the day after the operation or sometimes, but rarely, the following day. In the ward you may walk around freely.

Some specialists require that their patients wear neck collars. This is often because of the specialist's preference or because of certain technical factors. Other specialists will allow you to mobilise without a collar and wear it only at certain times whereas yet other specialists use collars only infrequently.

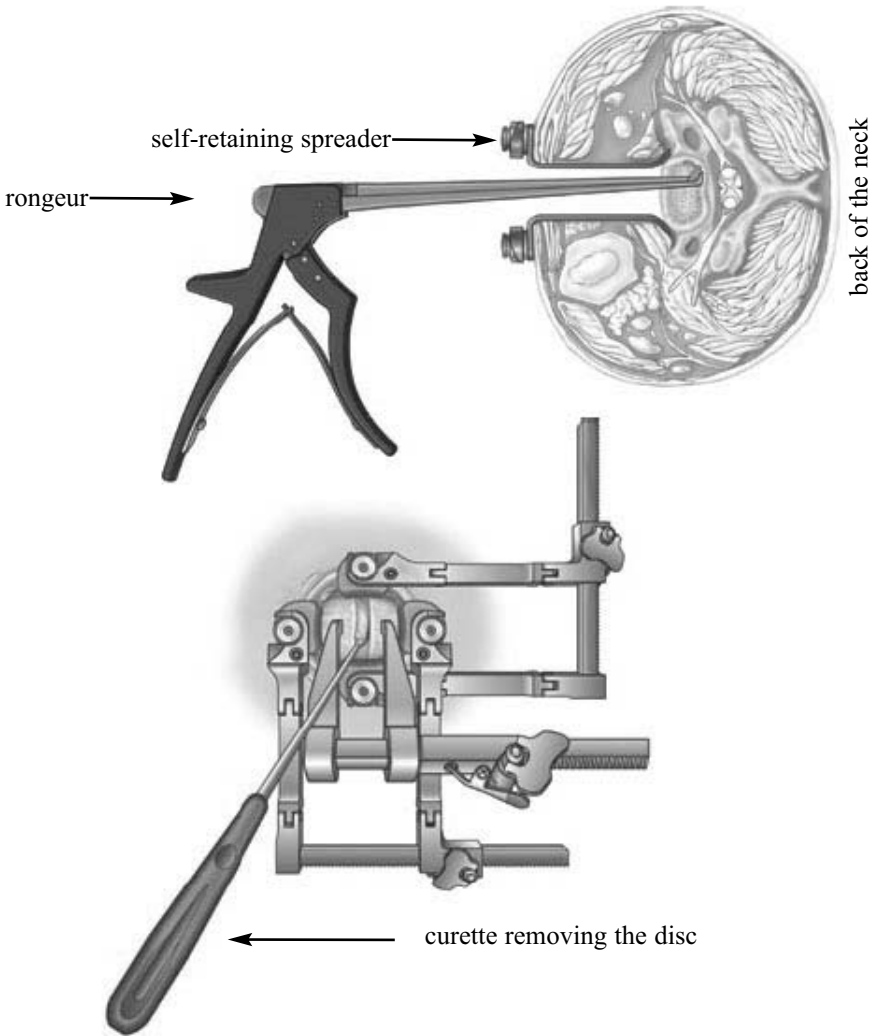
Appropriate neck exercises may be demonstrated to you by a physiotherapist.

Discharge

You would normally be discharged two or three days after surgery with analgesia to take home. A painful throat and even some hoarseness can be quite common and can last for as long as a few months, but usually lasts only for a few days.

Discomfort between the shoulder blades is a frequent occurrence and this is because the operation restores the height of the disc space, which causes temporary discomfort that will usually pass after a few weeks at most. Wound care will be discussed with you by the staff or your specialist.

My Spine - Cervical

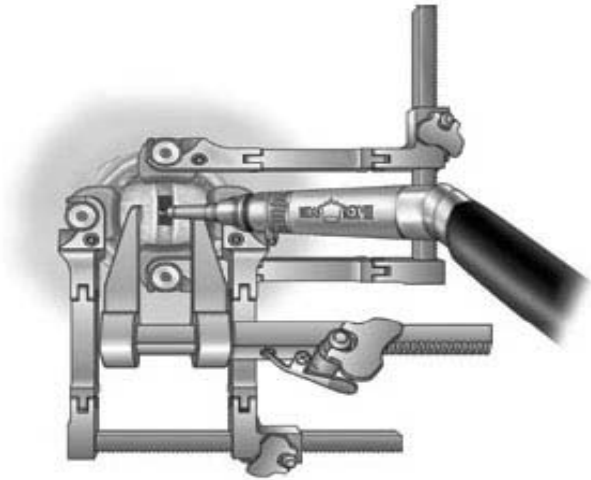


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Figure 16.3

The drawing at the top demonstrates the use of a rongeur, which is a long, thin grasping instrument that also helps to remove the disc. The drawing at the bottom demonstrates the use of a curette, which is a spoon-like instrument that is used to remove part of the disc.

My Spine - Cervical



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Figure 16.4

This drawing demonstrates the use of a drill to remove any hard bony outgrowths. This is not always necessary and depends on technical factors and specialist preference.

My Spine - Cervical

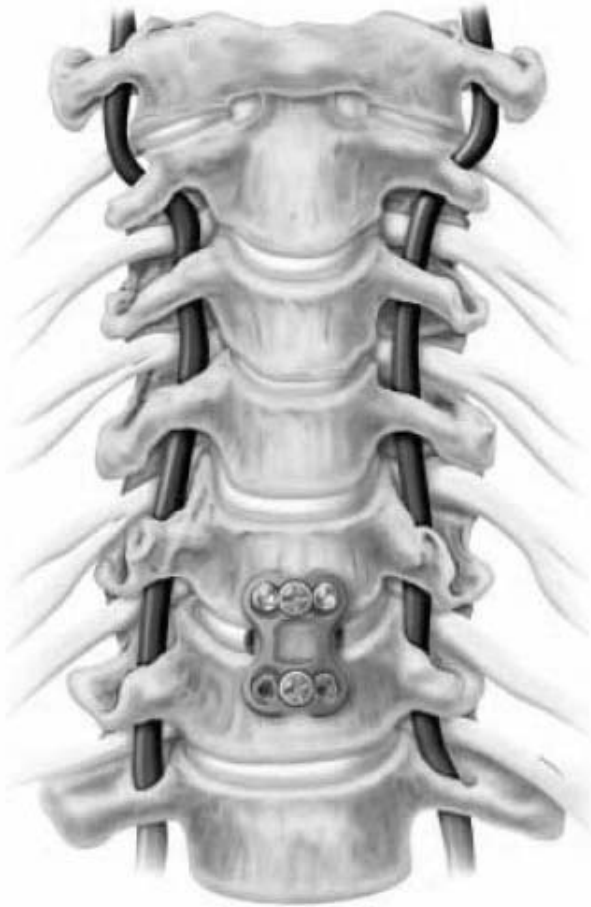


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Figure 16.5

This drawing demonstrates the prosthesis in place in the space that has been created by removing the disc. A metal plate is placed over the top to keep the prosthesis in place. Sometimes the disc space is left open, sometimes a bone block is placed in the space and sometimes an artificial spacer, called a cage, is used. A metal plate is not always used.

My Spine - Cervical

Rehabilitation

It is incredibly important to get a lot of rest and exercise following your surgery. Do not try to rush back to work, certainly not before two to three weeks following surgery. It is important to walk for exercise and also exercise in conjunction with the guidelines from your physiotherapist or biokineticist. You may perform normal activities and should only wear a neck brace if your doctor prescribed it. You should refrain from exercises that involve impact, for three months. This would particularly include jogging, mountain biking and equestrian pursuits.

Follow-up

You will usually be seen by your specialist after two to six weeks, but may be seen earlier if there are any complications. You would most probably undergo an X-ray of your neck a few months after the operation to evaluate the bone growth between the two vertebrae. 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 neck for the rest of your life and apply good neck habits.

CHAPTER 17



CERVICAL DISC ARTHROPLASTY

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

A cervical disc arthroplasty is performed for a cervical slipped disc. The reason why your specialist performs this procedure is because there is pressure on a nerve root that needs to be relieved. The aim of the operation is to remove the whole of the disc from the front of the neck. The secondary aim is to preserve spinal movement on that specific level by replacing the disc with an artificial disc prosthesis.

This operation is performed to prevent the abnormal movement at the adjacent disc segments that often occurs after an anterior cervical discectomy with fusion. A fusion is the traditional way of treating a slipped disc, but there is a definite movement away from this approach towards the use of a mobile prosthesis, such as an artificial disc. With a cervical disc replacement, less biomechanical stress is placed on the rest of the neck, because there is no fusion and therefore mobility is maintained.

When undergoing this operation you will be lying on your back and the specialist will be operating from the front. Your skin will be sterilised over the front of your neck with a combination of iodine and an alcohol solution and then the area will be covered with sterile drapes. A small incision will be made in the front of your neck and the tissue will be carefully separated up to the spine.



Images used with permission from Medtronic

Figure 17.1

The top drawing demonstrates the position that the patient is placed in before the operation. Please see the chapter Anterior Cervical Discectomy for a picture description of how the disc is removed. The second drawing demonstrates the placement of the artificial disc, also called a disc prosthesis, between the vertebrae in the space that was created by removing the disc.

My Spine - Cervical

With the use of a microscope, the damaged disc will be removed. Thereafter, an artificial disc prosthesis will be carefully placed in the middle of the space that was created by removing the disc. The position will be confirmed by an X-ray in theatre. There are many disc prosthesis and companies are developing new products all the time.

A drainage pipe will be placed in the wound and connected to a reservoir and the wound will be closed. This will allow all excess blood to drain away and not cause a blood clot next to the breathing tube, which can be quite dangerous.

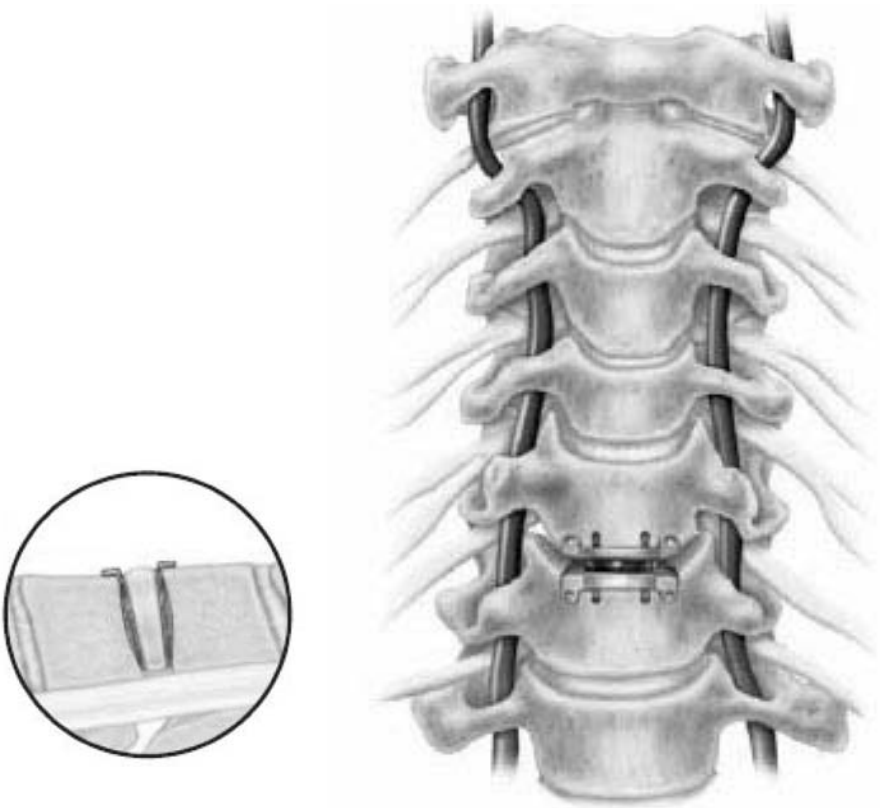
Following the operation, you will be taken to the recovery room to recover from your anaesthetic. Afterwards you will be monitored for several more hours to ensure that no blood clots form under the skin in the area of your neck. You may mobilise after the operation and the hospital staff will administer prescribed analgesics for post-operative pain.

Ward care

In the ward you may walk around freely. Some specialists request that their patients wear neck collars. This is often because of the specialist's preference or because of certain technical factors. Other specialists will allow you to mobilise without a collar and wear it only at certain times whereas other specialists use collars only infrequently.

You will most probably be seen by the physiotherapist who will demonstrate the appropriate neck exercises. The drainage pipe in your neck will normally be removed on the day after the operation or rarely the next day.

My Spine - Cervical



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Figure 17.2

The drawing on the right demonstrates a disc prosthesis in place as seen from the front. The prosthetic disc moves like a normal disc and preserves the movement across the section of the spine that is being operated on, unlike a fusion, where the two vertebrae grow together (fuse).

The drawing on the left is a close-up view from the side.

Discharge

You will normally be discharged two or three days after surgery with analgesics to take home. A painful throat and even some hoarseness can be quite common and can last for as long as a few months, but usually lasts only for a few days. Discomfort between the shoulder blades is a frequent occurrence, because the operation restores the height of the disc space and this causes temporary discomfort that will usually pass after a few weeks at most. Wound care will be discussed with you by the hospital staff or your specialist.

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 normal activities and should only wear a neck brace if your specialist prescribed it. You should refrain from exercises that involve impact, for 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. You would usually undergo an X-ray of your neck a few months after the operation to evaluate the position of the prosthesis.

It is important to realise that you will have to protect your neck for the rest of your life and apply good neck habits.

CHAPTER 18



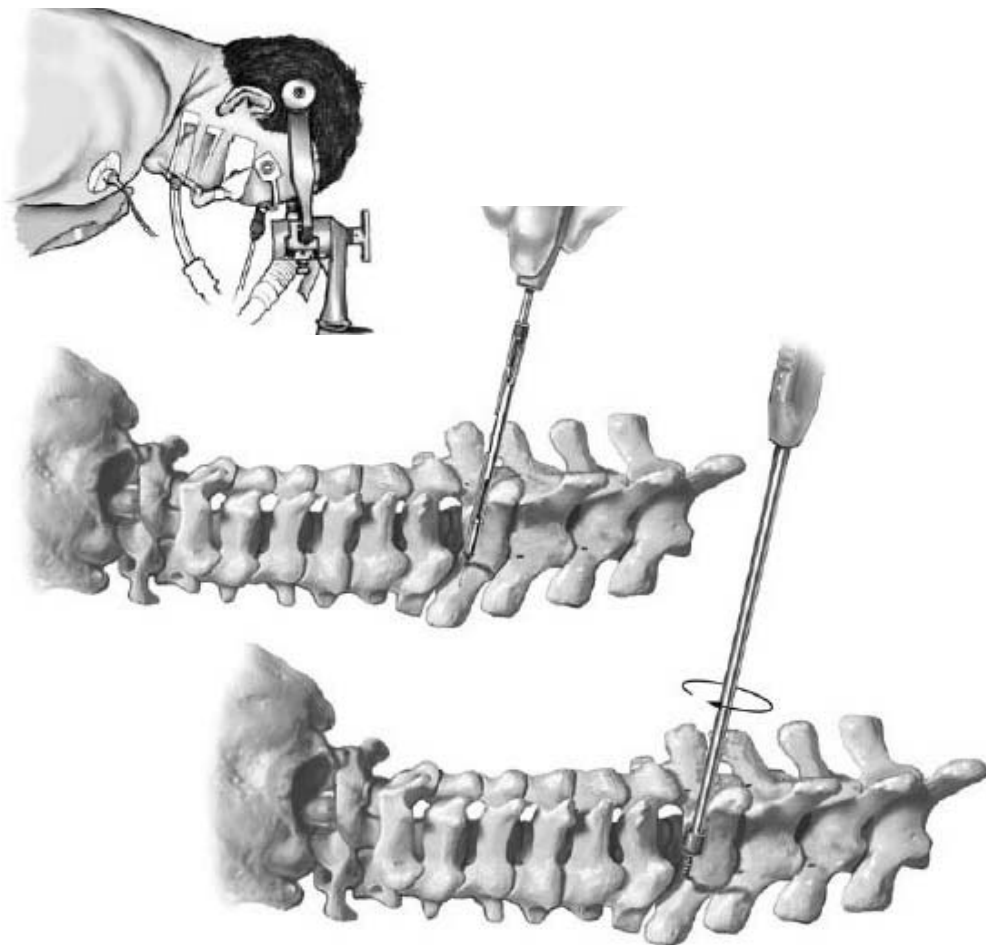
POSTERIOR CERVICAL FUSION

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

There are several reasons for performing a posterior neck fusion. Generally, this operation is performed for instability of the cervical spine (neck). The instability could be the result of trauma, but it could also be the result of extensive surgery that was needed to decompress spinal nerves. In other cases, the cervical spine has become unstable due to a degenerative condition such as rheumatoid arthritis.

There are many different techniques depending on the preference of the specialist and on the pathology that needs to be treated. There are techniques where wires are used to attach the spinous processes or the facet joints (see the chapter *Anatomy of the Spine*) to each other to stabilise the spine. Other techniques involve the use of metal clamps that hook on to the laminae. More robust fusions are made possible by putting screws into the lateral mass. This is the bit of bone that supports the facet joints and contains the tunnel through which the vertebral artery runs. Another technique is to put screws into the pedicles (see the chapter *Anatomy of the Spine*) of the cervical vertebrae.

It is frequently necessary to decompress the nerves before the fusion. See the chapter *Cervical Laminoplasty and Laminectomy* for a description of this part of the operation.



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Figure 18.1

These drawings demonstrate a fusion between the thoracic and cervical spine. There are many different variations of posterior (from behind) cervical fusions and different types of instrumentation. In all cases the instrumentation is attached to the vertebrae with screws or hooks.

The top drawing demonstrates the position in which the patient is placed to allow neck flexion. This way, the back of the neck is easily accessed. Specific bony landmarks are then identified and screws inserted as demonstrated in the bottom two drawings.

My Spine - Cervical

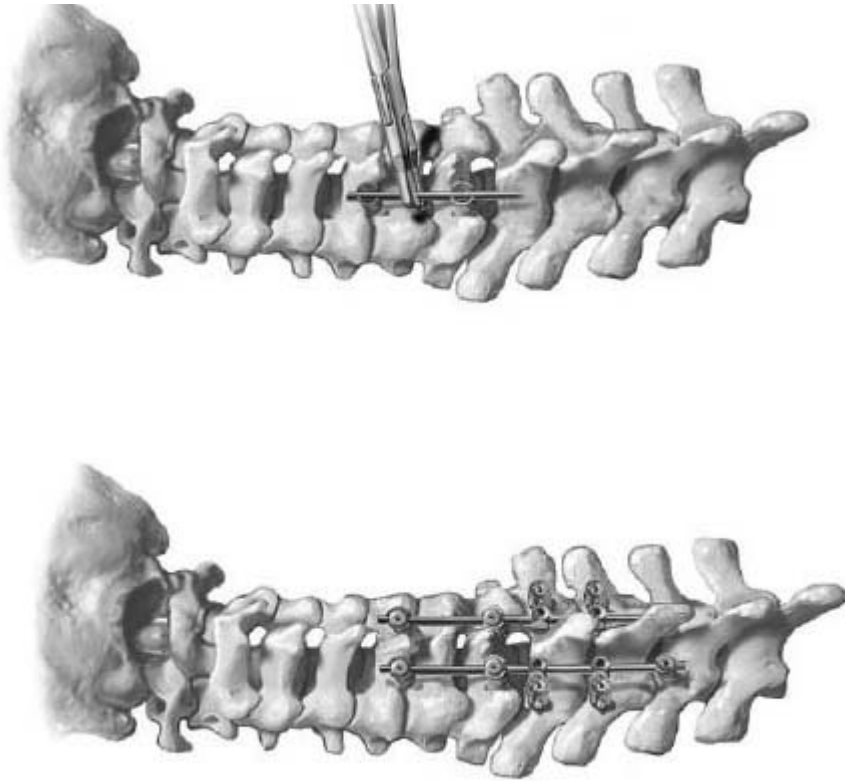
When undergoing this operation, you will be lying on your stomach and the specialist will be operating from the back of your neck. Your skin will be sterilised and the area will be covered with sterile drapes. An incision will be made and the tissue carefully separated up to the spine.

At this point a decompression procedure may or may not be performed by removing the laminae (see the chapter *Cervical Laminoplasty and Laminectomy*). The appropriate fusion technique will then be carried out. See the illustrations on the following pages for a description of the different techniques. In cervical fusion operations it is important that the instrumentation that is used should stabilise and correct the alignment of the spine and also that the bone being used as a bone graft, does in fact grow, and form a proper fusion. This is exactly the case as in lumbar fusion operations.

The main aim with a fusion operation is to achieve a bony fusion between the vertebrae concerned. If this is not the case, then the operation is not a success and another operation might have to be performed in the future. Bone growth is variable and depends on many factors and is different in different people. It is usually assumed that bone growth takes place from six weeks onwards and significant bone growth usually only occurs at about three to four months.

A drainage pipe will be placed in the wound and connected to a reservoir before the wound is closed. This will allow all excess blood to drain away. After the operation, you will be taken to the recovery room to recover from your anaesthetic. You will then be transferred to the ward or the high care unit. You may mobilise after the operation as soon as your specialist allows this and it will most probably be on the day following your operation. The nursing staff will administer analgesics for post-operative pain.

My Spine - Cervical



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Figure 18.2

These drawings demonstrate how the screws are placed in the vertebrae and then connected up with rods that are secured to keep the spine stable. After the screws and rods have been secured, bone is packed on top of the laminae to enhance bone growth between the vertebrae, leading to a fusion. The bone would normally be harvested from your body - the rim of the hip bone is a favourite donor area. Artificial bone may also be used. In the case above, a fusion has been performed between the cervical and the thoracic spine.

My Spine - Cervical

Ward care

In the ward you may walk around freely. You might be expected to wear a neck collar to keep the spine stable in the direct post-operative period and you might be expected to wear it for several months.

You will usually be seen by the physiotherapist who will demonstrate the appropriate neck exercises. The drainage pipe in your neck will be removed in the days following your operation.

Discharge

You would normally be discharged within the week after surgery with analgesics to take home. A painful throat and even some hoarseness can be quite common and usually only lasts a few days. Wound care will be discussed with you by the nursing staff or your specialist.

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 normal activities and should only wear a neck brace if your specialist prescribes it. You should refrain from exercises that involve impact, for six to nine 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. You would usually undergo an X-ray of your neck a few months after the operation to evaluate the bone growth between the two vertebrae.

My Spine - Cervical

It is important that this bony growth takes place; otherwise the operation might have to be repeated.

Remember to always protect your neck and apply good neck habits.

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