Disorders affecting intervertebral discs include disc herniation (prolapsed intervertebral disc), degenerative disc disease and infection (discitis).

Spinal disc problems can lead to symptoms of back pain and/or sciatica. There are many other causes of back pain and/or sciatica but they do not primarily originate from the intervertebral discs. This article focuses on thoracic, lumbar and sacral disc problems. Cervical disc problems are discussed in the separate Cervical Disc Protrusion and Lesions article.

Back pain with/out sciatica is extremely common. Most may be classified as 'simple' back pain where serious underlying pathology is unlikely. However, the clinician must always be aware of 'red flag' warning signs which may merit investigations or even emergency admission.

Anatomy
The spinal cord is shorter than the spinal canal. The cord ends between the L1 and L2 vertebrae in adults and between L2 and L3 in children. Below the termination of the cord, the nerve roots form the cauda equina which has a horse-tail like appearance. The cauda equina contains the nerve roots L1-L5 and S1-S5. Spinal pathology below L1 of the vertebral column produces mostly lower motor neurone signs.

The intervertebral discs lie between adjacent vertebrae. They consist of a peripheral fibrocartilaginous part called the annulus fibrosus and a central semifluid/gelatinous part - the nucleus pulposus.

Assessment of a patient presenting with back pain and/or sciatica
This is described in detail in the separate Examination of the Spine, Low Back Pain and Sciatica and Neurological Examination of the Lower Limbs articles.

When to refer someone with low back pain/sciatica

- If there are red flag symptoms and signs that may suggest a serious underlying cause, admit or urgently refer for specialist assessment to confirm or exclude the diagnosis, depending on clinical judgement.
- If there is progressive, persistent, or severe neurological deficit: refer urgently to neurosurgery or orthopaedics for specialist assessment (ideally to be seen within one week), depending on local referral pathways.
- If pain or functional impairment persists for more than 1-2 weeks:
  - Offer early referral for physiotherapy.
  - Consider referral to a specialist low back pain and sciatica service for assessment for an epidural corticosteroid injection.
  - Advise the person on self-referral to Occupational Health services if they are unable to work or are having difficulty functioning at work.
- If pain or functional impairment persists for more than 6-8 weeks: consider referral to a specialist low back pain and sciatica service (ideally to be seen within two weeks) for further assessment, possible imaging, and consideration for surgical intervention.
- If pain or functional impairment persists despite the above measures (including intractable pain not responding to strong opioids): consider referral to a specialist pain clinic.
Prolapsed intervertebral disc

See also the separate articles on *Cervical Disc Protrusion and Lesions* and *Low Back Pain and Sciatica*.

- The nucleus pulposus of the disc is usually contained by the annulus fibrosus. If the nucleus herniates, it can irritate and/or compress the adjacent nerve root, causing symptoms of sciatica.
- Traumatic disc herniation can occur. Disc herniation can also occur secondary to degenerative disc disease.
- A herniated nucleus pulposus is most common in those aged below 40 years, whilst degeneration of discs tends to affect those aged over 40 years, with the prevalence increasing with advancing age. Disc lesions of the lumbar spine are more common than those of the cervical spine and disc lesions of the thoracic spine are rare.
- The term sciatica is used for the pain, tingling and numbness that arise due to nerve root entrapment in the lumbosacral spine. The symptoms may be felt in one or more of the lumbar nerve roots. About 90% of cases of sciatica are caused by a herniated intervertebral disc. This most commonly occurs at the L5/S1 level. See also the separate *Low Back Pain and Sciatica* article.

**Presentation**

**Lumbosacral disc herniation**

- If there is nerve entrapment in the lumbosacral spine, this leads to symptoms of sciatica which include:
  - Unilateral leg pain which radiates below the knee to the foot/toes.
  - The leg pain being more severe than the back pain.
  - Numbness, paraesthesia, weakness and/or loss of tendon reflexes, which may be present and are found in the same distribution and only in one nerve root distribution.
  - A positive straight leg raising test (there is greater leg pain and/or more nerve compression symptoms on raising the leg).
  - Pain which is usually relieved by lying down and exacerbated by long walks and prolonged sitting.

- The functional distribution of the lumbar nerve roots and the sciatic nerve are detailed in the separate *Low Back Pain and Sciatica* article.
- Large herniations can compress the cauda equina, leading to symptoms/signs of saddle anaesthesia, urinary retention and incontinence as described above.
- Symptoms tend at least to resolve partially in 66% of people with a disc herniation, after six months. This is because the herniated portion tends to regress over time.
However, nerve root compression can lead to permanent nerve damage with sensory and motor deficit.\[1\]

**Thoracic disc herniation**

- Disc lesions in the thoracic spine can lead either to nerve root irritation or to cord compression.
- Thoracic spine lesions can present with symptoms similar to lumbar disc lesions.
- In nerve root irritation, there may be shooting pain down the legs.
- There may be pain, paraesthesia or dysaesthesia in a dermatomal distribution.
- A thoraco-abdominal sensory examination can help to determine the level of the lesion: the nipple is innervated by T4; the xiphoid by T7; the umbilicus by T10; the inguinal region by T12.
- Testing of the abdominal and cremasteric reflexes can help to identify myelopathy and cord compression.
- Cord compression:
  - This is a neurosurgical emergency.
  - Cord compression in the thoracic spine can produce paraplegia.
  - There may be clonus or a positive Babinski reflex.
  - There may be bladder/bowel dysfunction.
  - Herniation of T2-T5 can mimic cervical disc disease.

**Investigation**

- No investigation may be needed if symptoms settle within six weeks.
- MRI is very sensitive in showing disc herniations.
- CT myelography may also be used.
- Plain X-rays are sometimes useful, as they can show misalignments, instabilities and congenital anomalies well.

**Management**\[1\]

Spinal cord compression or cauda equina syndrome are neurological emergencies that require immediate referral and intervention.

- Analgesia:
  - Simple analgesics as first line (paracetamol/non-steroidal anti-inflammatory drug). These may be used in combination.
  - A weak opioid such as codeine or tramadol may be added if pain is still present.
  - Consider a benzodiazepine (eg, diazepam) if there is muscle spasm.
  - Consider a trial of a tricyclic antidepressant or gabapentin if there is persistent sciatica.
  - If stronger analgesia is needed, refer to a pain clinic/specialist service.

- Encouragement to keep active: swimming is a good exercise.
- Heat and massage may relieve muscle spasm.
- Avoidance of activities that may aggravate pain - eg, lifting, prolonged sitting.
- Physiotherapy.
- Surgery:\[3\]
  - Pain due to a herniated lumbosacral disc may settle within six weeks. If it does not, or there are red flag signs such as the possibility of cauda equina syndrome, referral to an orthopaedic surgeon or a neurosurgeon should be considered.
  - Interventions for people with chronic intractable pain or neurological complications include removal of the protruding disc (discectomy) and/or spinal fusion.
  - The National Institute for Health and Care Excellence (NICE) recommends that prosthetic intervertebral disc replacement may be used in the treatment of symptomatic degenerative disc disease of the lumbar spine.
  - NICE recommends that percutaneous intradiscal laser ablation in the lumbar spine may be considered as a treatment option.\[4\]
  - The current evidence of percutaneous endoscopic laser lumbar discectomy is inadequate for it to be considered as a treatment option.\[5\]

**Complications**\[1\]

- Permanent nerve damage with sensory deficits and/or permanent motor weakness.
- Psychosocial problems.
- Loss of employment.
Prognosis[1]

- The prognosis for acute sciatica is favourable for most people. The herniated portion of an intervertebral disc causing sciatica tends to regress over time and 66% of people have at least partial resolution after six months.
- About 50% of people with acute sciatica report some improvement within ten days and about 75% report some improvement after four weeks. However, up to 30% of people continue to have pain for one year or longer.
- The prognosis is worse for women and people who initially have greater disability or pain.
Prevention

- Regular exercise.
- Weight loss if overweight.
- Safe lifting techniques.
- Correct sitting position and posture.

Degenerative disc disease[^6]

- Intervertebral disc degeneration is one of the major causes of low back pain.
- The exact cause of this is not known. Some suggest that it is a natural part of ageing; however, disc degeneration can also occur in young people. The cause is likely to be multifactorial, including genetic, environmental, traumatic, inflammatory, infectious and other factors.
- Annular tears, internal disc disruption and resorption, disc space narrowing, disc fibrosis and osteophyte formation can all occur.
- Degenerative disc disease may lead to disc herniation.

Discitis[^7,8,9]

Pyogenic infections of the spine are relatively rare with an incidence between 1 in 100,000 and 1 in 250,000 per year but the incidence is increasing due to increases in average life-expectancy and medical comorbidities.

Pathophysiology

- Discitis is inflammation of the vertebral disc space. It is usually associated with infection and can co-exist with vertebral osteomyelitis (spondylodiscitis).
- It most commonly affects the lumbar spine. The thoracic spine is least commonly affected with the cervical spine between the two.
- There is usually haematogenous spread of infection from other parts of the body. The urinary tract, lungs and soft tissues are common primary sites for infection. It may be difficult to find a primary site.
- *Staphylococcus aureus* is the most common pathogen.
- Discitis can occur in children but most commonly affects males aged in their 50s.
- Risk factors include any cause of immunosuppression (including diabetes) and intravenous drug use.
- Discitis may rarely follow surgery involving the disc space.

Presentation

Diagnosis is difficult and often delayed or missed due to the rarity of the disease and the high frequency of low back pain in the general population.

- An insidious onset is common, with neck or back pain and localised tenderness. Pain is worse on movement. Mobility may be restricted.
- There may be associated fever and weight loss.
- Neurological deficit may be present. This is more likely in the cervical spine.

Investigations

- ESR and CRP are raised. They can be used to monitor response to treatment.
- White blood cell count may be normal.
- Blood cultures, sputum, urine and any other appropriate cultures should be taken to look for the source of infection.
- X-ray of the spine may show disc space narrowing, end-plate irregularities and annulus calcification. Osteomyelitis changes may be seen including decreased bone density and bone destruction. However, X-ray may be normal initially.
- Nuclear medicine scans may be helpful.
- CT and MRI scanning show changes earlier than plain X-ray. MRI is the most sensitive and specific.
- CT-guided or open biopsy of the infected disc space area can provide histological confirmation of discitis and allow culture. Surgical debridement may be carried out at the same time.
Management

- Antibiotics are needed. These should be adjusted if/when culture results are available. Parenteral treatment is usually used and may be needed for 6-8 weeks. ESR can be used to monitor response.
- Immobilisation: two weeks of bed rest have been suggested, followed by immobilisation with a brace, which may be needed for 3-6 months.
- Analgesia should be prescribed as required.
- Surgical treatment may be needed if there is neurological deficit, spinal deformity or lack of response to antibiotic treatment.

Prognosis

- Antibiotic treatment with/without surgery is usually successful in treating the condition. However, a minority will have permanent neurological deficits.
- Complications can include spread of infection into the epidural space or paraspinal soft tissues.
- Mortality is reported as about 2%.

Further reading & references

- Low back pain in adults: early management; NICE Clinical Guideline (May 2009)
- Sciatica (lumbar radiculopathy); NICE CKS, April 2015 (UK access only)
- Prosthetic intervertebral disc replacement; NICE Interventional Procedure Guidance, July 2009
- Percutaneous intradiscal laser ablation in the lumbar spine; NICE Interventional Procedure Guidance, September 2010
- Percutaneous endoscopic laser lumbar discectomy; NICE Interventional Procedure Guidance, May 2009

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