Spinal Cord Compression

See also separate Whiplash and Cervical Spine Injury article.

Acute spinal cord compression is a neurosurgical emergency. Rapid diagnosis and management are essential to have the highest chances of preventing permanent loss of function.

Causes of spinal cord compression

- **Trauma** (including car accidents, falls and sports injuries):
  - There is usually either vertebral fracture (most common in cervical vertebrae) or facet joint dislocation.
  - Complete transection of the spinal cord can occur.
  - Hemisection of the spinal cord can occur and is known as Brown-Séquard's syndrome. It is usually caused by a penetrating trauma.

- **Tumours**, both benign or malignant:
  - These can include bone tumours, primary or metastatic tumours, lymphomas, multiple myeloma and neurofibromata.
  - Acute myelopathy in patients with cancer can also be caused by irradiation, paraneoplastic necrotising myelitis, ruptured intervertebral disc and meningeal carcinomatosis with spinal cord involvement.

- **A prolapsed intervertebral disc**:
  - L4-L5 and L5-S1 are the most common levels for disc prolapse. Large disc herniations can cause cauda equina syndrome. See separate Cauda Equina Syndrome article which discusses it in more detail.
  - Cervical disc herniation can also occur.

- **An epidural or subdural haematoma**:
  - There may be a history of trauma, a recent spinal procedure and/or the patient may be on anticoagulant therapy.

- **Inflammatory disease**, especially rheumatoid arthritis:
  - In rheumatoid arthritis there is often considerable weakness of the ligament that holds the odontoid peg. If this ruptures, the atlas can slip forward on the axis and compress the high cervical spine.

- **Infection**:
  - Spinal infections can be acute or chronic.
  - Acute infections are usually bacterial; chronic infections are usually due to tuberculosis or fungal infection.
  - Vertebral osteomyelitis, discitis or haematogenous spread of infection can lead to an epidural abscess.

- **Cervical spondylitic myelopathy**:
  - The ageing process can lead to narrowing of the spinal canal due to osteophytes, herniated discs and ligamentum flavum hypertrophy.
  - In advanced stages, it can cause spinal cord compression.

- **Spinal manipulation**:
  - Damage to the spinal cord may be a very rare complication of chiropractic or osteopathic manipulation of the neck.
Presentation

See separate Examination of the Spine, Neurological History and Examination, Neurological Examination of the Upper Limbs and Neurological Examination of the Lower Limbs articles.

Red flags

See also separate Neck Pain (Cervicalgia) and Torticollis and Low Back Pain and Sciatica articles. Red flags that suggest spinal compression include:

- Insidious progression.
- Neurological symptoms: gait disturbance, clumsy or weak hands, or loss of sexual, bladder, or bowel function.
- Neurological signs:
  - Lhermitte’s sign: flexion of the neck causes an electric shock-type sensation that radiates down the spine and into the limbs.
  - Upper motor neurone signs in the lower limbs (Babinski’s sign: up-going plantar reflex, hyperreflexia, clonus, spasticity).
  - Lower motor neurone signs in the upper limbs (atrophy, hyporeflexia).
  - Sensory changes are variable, with loss of vibration and joint position sense more evident in the hands than in the feet.

Motor, sensory and autonomic dysfunction can occur. The latter can lead to neurogenic shock, paralytic ileus, aspiration, urinary retention, priapism and loss of thermoregulation. Clinical features depend upon the extent and rate of development of cord compression.

- Motor symptoms can include ready fatigue and disturbance of gait.
- Cervical spine lesions can produce quadriplegia. Injury above the level of C3, C4, C5 (the segmental level of the phrenic nerve) cause paralysis of the diaphragm and artificial ventilation is required.
- Thoracic spine lesions produce paraplegia.
- Lumbar spine lesions can affect L4, L5 and sacral nerve roots.
- Sensory symptoms can include sensory loss and paraesthesia. Light touch, proprioception and joint position sense are reduced.
- There can be root pain in the legs.
- Tendon reflexes are typically:
  - Increased below the level of injury and/or compression.
  - Absent at the level of injury and/or compression.
  - Normal above the level of injury and/or compression.

- Sphincter disturbances - late features of cervical and thoracic cord and/or compression.
- There may be loss of autonomic activity with lack of sweating below the level, loss of thermoregulation and drop in peripheral resistance causing hypotension.

Investigations

- Haemoglobin and haematocrit levels should be measured initially and monitored serially to monitor blood loss.
- Renal function and electrolytes: dehydration.
- MRI scan of the whole spine.
- Further investigations will depend on the underlying cause for cord compression.

Spinal cord compression due to metastases[^1]

- The most frequent histological types of cancer that give rise to bone metastases are breast, prostate and lung cancer.
- Most of the spinal metastases are diagnosed following the diagnosis of the primary cancer. However, in about 10% of the patients, spinal metastases are the first manifestation of an unknown primary tumour.
- Spinal cord compression occurs in up to 20% of the patients with spinal metastases.
Metastatic epidural spinal cord compression affects almost 5% of patients with cancer\textsuperscript{[4]}. However, less than 0.1% of people with back pain who visit their general practitioner have spinal metastases\textsuperscript{[3]}. Spinal pain is often present for three months and neurological symptoms for two months before paraplegia, but almost 50% of patients are unable to walk by the time of diagnosis. Of these, almost 70% remain immobile. Of those able to walk at treatment, about 80% remain ambulant\textsuperscript{[3]}.

Management

- Nurse the patient flat with the spine in neutral alignment (eg, using logrolling or turning beds) until spinal stability and neurological stability are ensured.
- Give a course of dexamethasone unless contra-indicated until a definitive treatment plan is made.
- Manage postural hypotension with positioning and devices to improve venous return; avoid overhydration.
- Insert a catheter to manage bladder dysfunction.
- Use breathing exercises, assisted coughing, and suctioning to clear airway secretions.
- Follow the National Institute for Health and Care Excellence (NICE) guidance for the prophylaxis of venous thromboembolism, the prevention and treatment of pressure ulcers and the management of bowel dysfunction.
- Offer and provide psychological and spiritual support as needed (including after discharge).
- Analgesia, palliative radiotherapy, spinal orthoses, vertebroplasty or kyphoplasty, or spinal stabilisation surgery may be required for pain control.
- Bisphosphonates should be offered to all patients with vertebral involvement from myeloma and breast cancer and to patients with prostate cancer in whom conventional analgesia is inadequate.
- Specialised pain control procedures may be needed for intractable pain (eg, epidural analgesia).
- If definitive treatment of the cord compression is appropriate, it should be started before patients lose the ability to walk or before other neurological deterioration occurs, and ideally within 24 hours.
- Definitive treatment may be using surgery (eg, laminectomy, posterior decompression ± internal fixation) or using radiotherapy.
- Discharge should be fully planned and community-based rehabilitation and support should be available when the patient returns home. This includes support and any necessary training of carers and families.

NICE recommendations for the diagnosis and management of patients at risk of or with metastatic spinal cord compression\textsuperscript{[4]}:

- The aims of the NICE guidelines are to accelerate the diagnosis of spinal cord compression and to ensure that appropriate specialised management, usually surgery and/or radiotherapy, is available within 24 hours of presentation\textsuperscript{[5]}. The goal is to prevent paralysis from metastatic spinal cord compression.
- The following symptoms suggest possible spinal metastases in those with cancer:
  - Pain in the thoracic or cervical spine.
  - Severe unremitting or progressive lumbar spinal pain.
  - Spinal pain aggravated by straining (eg, coughing, sneezing, passing stool).
  - Nocturnal spinal pain preventing sleep.
  - Localised spinal tenderness.
- The following symptoms suggest metastatic spinal cord compression in patients with cancer and pain suggestive of spinal metastases:
  - Radicular pain.
  - Limb weakness.
  - Difficulty in walking.
  - Sensory loss, or bladder or bowel dysfunction.
  - Neurological signs of spinal cord or cauda equina compression.
- MRI of the whole spine (not plain X-rays) should be carried out so that definitive treatment can be planned. This should be:
  - Within one week if clinical features suggest spinal metastases.
  - Within 24 hours if clinical features suggest spinal cord compression.
  - Sooner (including out of hours) if emergency treatment is needed.
A Cochrane review of the interventions for metastatic extradural spinal cord compression in adults found\[6\]:

- Ambulant adults with stable spines and predicted survival of less than six months probably benefit as much from one dose of radiation as from two or eight doses.
- Decompressive surgery followed by radiotherapy may benefit ambulant and non-ambulant adults younger than 65 years of age, with poor prognostic factors for radiotherapy, a single area of compression, paraplegia for less than 48 hours, and a predicted survival of more than six months.
- It was unclear whether high doses of corticosteroids offered any benefits over moderate doses or no corticosteroids, but high-dose steroids probably significantly increases the risk of serious adverse effects.
- Early detection and treatment based on neurological status, age and estimated survival are crucial with all treatment modalities.

Complications

Complications will depend on the site of compression and the severity of associated neurological dysfunction. Complications may include:

- Pressure sores: careful and frequent turning of the patient is essential.
- Hypothermia.
- Potential lung complications include aspiration, pneumonia, acute respiratory distress syndrome, atelectasis, ventilation-perfusion mismatch and decreased coughing with retention of secretions.
- Depression associated with restriction of activities of daily living.

Prognosis

- The spinal cord has very limited powers of regeneration.
- Prognosis for neurological deficit depends on the magnitude of the spinal cord damage present at the onset.
- As well as neurological dysfunction, the prognosis is also determined by the prevention and effective treatment of infections - eg, pneumonia, and urinary tract infections.
- The prognosis will also depend on the underlying cause of cord compression.

Further reading & references


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