Cervical Disc Protrusion and Lesions

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

- There is no disc between C1 and C2 (atlas and axis), and only ligaments and joint capsules limit excessive motion.
- Disc degeneration or herniation can injure the spinal cord or nerve roots.
- Cervical radiculopathy is compression or injury to a nerve root in the cervical spine. Its most common causes are cervical disc herniation and degenerative disease[1].
- The term myelopathy is used to describe any neurological deficit related to the spinal cord itself. Myelopathy may be due to compression of the spinal cord by a prolapsed cervical disc.


Causes of cervical disc disorders

Cervical disc disorders can include:

Disc herniation (prolapsed intervertebral disc)
- The nucleus pulposus bulges or breaks through the annulus of the disc.
- It may occur from a single whiplash injury but repetitive injuries are more common.
- Cervical disc herniation occurs most frequently at the levels of C4/5, C5/6 and C6/7.
- Posterior herniation causes symptoms by compressing the cord or a nerve root, or by stretching the posterior longitudinal ligament or posterior annulus.

Degenerative disc disease (cervical spondylosis)
- 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.
- See separate Cervical Spondylosis article

Internal disc disruption
- This includes damage to the disc without external deformity.
- It may result from whiplash or other trauma to the neck.
- Degenerative disc disease can progress to internal disc disruption.
- See separate Whiplash and Cervical Spine Injury article.

Infection (discitis)
- See separate Spinal Disc Problems (including Red Flag Signs) article.

Assessment

See also separate Examination of the Spine article. During assessment of a patient with neck pain, always be alert to red flag symptoms or signs.

Red flags for neck pain[1]

A serious underlying cause is more likely in people presenting with:
- New symptoms before the age of 20 years or after the age of 55 years.
- Weakness involving more than one myotome or loss of sensation involving more than one dermatome.
- Intractable or increasing pain.

Red flags suggesting possible malignancy, infection or inflammation:
- Fever.
- Unexplained loss of weight.
- History of inflammatory arthritis.
- History of malignancy, drug misuse, tuberculosis, AIDS, or other infection.
- Immunosuppression.
- Pain that is increasing, unremitting and/or disturbs sleep.
- Lymphadenopathy.
- Exquisite localised tenderness over a vertebral body.

Red flags suggesting myelopathy (compression of the spinal cord):
- Insidious progression.
- Gait disturbance; clumsy or weak hands; loss of sexual/bladder/bowel function.
- Lhermitte’s sign (flexing the neck causes electric shock-like sensations that extend down the spine and shoot 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).
- Variable sensory changes (loss of vibration and joint position sense more evident in the hands than in the feet).

Red flags suggesting severe trauma/skeletal injury:
- History of trauma.
- Previous neck surgery.
- Osteoporosis or risk factors for osteoporosis.
- Increasing and/or unremitting pain.

Red flags suggesting vascular insufficiency:
- Dizziness and blackouts (restriction of vertebral artery) on movement, especially on extension of the neck with upward gaze.
- Dizziness, drop attacks.

History
- If there was an injury, note the time since the injury and the mechanism.
- Ask about the pain:
  - Note the distribution. Neck pain can radiate to an upper limb. Pain is usually unilateral but it may be bilateral. Pain can disturb sleep. Neck pain is frequently absent in radiculopathy.
  - Ask about speed of onset. Insidious onset of symptoms is usual in cervical radiculopathy but it may be abrupt in acute injury.
  - Pain from the disc without nerve root involvement is typically vague, diffuse and distributed axially.
  - Activities that raise pressure in the disc, such as lifting or a Valsalva manoeuvre, will exacerbate symptoms. Lying down decreases pressure in the disc and eases pain.
  - Driving causes vibration that aggravates disc pain.
- Make a systematic enquiry about general health. Fever suggests infection. Unintentional weight loss suggests malignancy.

Examination
- If pain originates from the disc but there is no nerve root involvement, there will be normal neurological examination.
- Tenderness with movement in the posteroanterior plane may suggest disc pathology.
Signs of radiculopathy on examination:
- The neck will show a decreased range of movement. This is very common with pain and spasm from any cause.
- Extension and rotation increase pain. In Spurling's manoeuvre, the patient’s neck is extended, bent laterally and held down. It elicits radicular symptoms.
- In the abduction sign, pain improves when the neck is flexed or on abduction of the affected arm over the top of the head.
- Upper limb weakness, paraesthesia, dermatomal sensory deficit and changes to reflexes can occur as outlined in the table below[1].
- A herniated disc can also produce thermal changes (thermatomes) in specific distributions.

### Neurological features associated with cervical radiculopathy

<table>
<thead>
<tr>
<th>Nerve root</th>
<th>Muscle weakness</th>
<th>Reflex changes</th>
<th>Sensory changes</th>
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</table>
| C5         | - Shoulder abduction and flexion  
             - Elbow flexion | - Biceps | - Lateral arm |
| C6         | - Elbow flexion  
             - Wrist extension | - Biceps  
             - Supinator | - Lateral forearm  
             - Thumb  
             - Index finger |
| C7         | - Elbow extension  
             - Wrist flexion  
             - Finger extension | - Triceps | - Middle finger |
| C8         | - Finger flexion | - None | - Medial side lower forearm  
             - Ring and little fingers |
| T1         | - Finger abduction and adduction | - None | - Medial side upper forearm  
             - Lower arm |

Signs of myelopathy on examination:
- Increased upper and lower limb reflexes or other upper motor neurone signs suggest myelopathy.
- Upper motor neurone signs include:
  - Weakness.
  - Spasticity.
  - Hyperreflexia.
  - Positive Babinski’s sign (up-going plantars).
  - Clonus.
  - Positive Hoffman’s reflex (flicking a finger causes adjacent fingers to flex).

- Sphincter disturbances are late features of cervical and thoracic cord compression.
- Cervical spine lesions can produce quadriplegia.
- Urgent evaluation and action are needed.

**Differential diagnosis of neck pain[1, 2, 3, 4]**

- It is easy to diagnose that pain originates from the neck but being sure that there is a disc lesion usually requires imaging studies.
- Neck pain in the general population is common[5]. Most will not be a disc lesion.
- Differential diagnoses include:
  - Cervical spondylosis.
  - Traumatic prolapsed intervertebral disc.
  - Simple neck pain: acute neck strain, postural neck ache or whiplash.
  - Headache.
  - Referred pain - eg, from the shoulder.
  - Malignancy: primary tumours, secondary deposits or myeloma.
  - Infections: discitis, osteomyelitis or tuberculosis.
  - Fibromyalgia.
  - Vascular insufficiency.
  - Psychogenic neck pain.
  - Inflammatory disease: rheumatoid arthritis.
  - Metabolic diseases: Paget's disease of bone, osteoporosis.
Investigations

Neck pain with radiculopathy and no red flag features usually does not require imaging studies or other special investigations, as it is likely to be self-limiting\[1\]. Immediate admission and decompression are required for myelopathy (spinal cord compression).

- Blood tests may be guided by suggestions of other rheumatological pathology:
  - FBC may show anaemia of chronic disease or evidence of infection.
  - Elevated ESR is nonspecific but suggests an inflammatory process.
  - Rheumatoid factor should be requested if rheumatoid arthritis is considered and HLA-B27 may indicate ankylosing spondylitis.

- Imaging studies are important but they should be interpreted in the light of the clinical picture, as positive findings are quite common in people without any complaints:
  - Plain X-ray of the cervical spine may be used to evaluate chronic degenerative changes, metastatic disease, infection, spinal deformity, and stability. Interpretation is difficult because degenerative features are almost universal over the age of 35 years.
  - An MRI scan may be indicated if X-rays show no significant abnormality but symptoms are continuing. MRI should be performed to assess for an intervertebral disc herniation, with or without compressive or spondylotic osteophytes\[6\].
  - CT myelography may be considered if there are any contra-indications to MRI\[6\].

- Electromyography may be helpful if it is unclear whether the patient has cervical radiculopathy or a nerve entrapment syndrome in the upper extremity\[7\].

Management\[1\]

- Look for and treat any comorbidity.
- Drug treatment:
  - Analgesia may relieve pain and help muscle spasm.
  - If pain is chronic and severe, analgesia may be enhanced by the addition of amitriptyline or gabapentin.
  - Diazepam for 3-7 days may be useful for people with severe muscle spasm.

- Early mobilisation is important.
- Physiotherapy including stabilisation exercises and posture training may be valuable.
- Heat and massage may relieve muscle spasm.
- Neck supports should be used for as short a time as possible (ie 2-4 days) and under supervision.
- There is insufficient evidence to recommend manual therapies such as manipulation.
- Surgery:
  - The finding of a disc lesion does not mean that surgery is indicated and in most cases conservative management is all that is needed. There may be spontaneous regression of a herniated disc\[8\].
  - If there are significant neurological abnormalities such as upper motor neurone signs in the limbs or bladder disturbance, surgical decompression is indicated.
  - Surgery may also be indicated in intractable pain.

Complications

- If an intervertebral disc compresses the spinal cord, it can produce myelopathy with weakness, hyperreflexia and neurogenic bowel and bladder dysfunction. There may be associated significant upper limb weakness or numbness as well as pain.
- Beware of missing serious underlying disease, including malignancy, infections producing abscesses and inflammatory conditions. Always be alert to red flags.

Prognosis

- The prognosis for cervical radiculopathy is favourable: symptoms resolve in most people and without surgical treatment\[6\].
- Surgery also has good results but is indicated in only a minority. It is likely that the attitude of the patient to active rehabilitation is very important for a good result. However, the general prognosis for neck pain is not good and it is often chronic and persistent.

Further reading & references

1. Neck pain - acute torticollis; NICE CKS, April 2015 (UK access only)
2. Neck pain - non-specific; NICE CKS, April 2015 (UK access only)
3. Neck - whiplash injury; NICE CKS, April 2015 (UK access only)
4. Neck pain - cervical radiculopathy; NICE CKS, April 2015 (UK access only)