

Cervical myelopathy

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Abstract

Cervical myelopathy is a condition caused by narrowing of the spinal canal leading to dysfunction. The most common causes are congenital stenosis and degenerative stenosis caused by spondylosis. Whatever the underlying disease process, the compression is usually progressive and will often require surgical intervention to prevent increasing disability. Many patients experience significant improvement in symptoms after surgery, so operative intervention should be considered for almost all patients. Early recognition and treatment prior to spinal cord damage is critical to ensure a good clinical outcome.

Keywords aetiology; cervical myelopathy; classification; management; surgery

Introduction

Cervical Myelopathy is a condition involving narrowing of the spinal canal causing compression of the long tracts in the spinal cord, leading to dysfunction. The normal diameter of the cervical spinal canal is between 17 mm and 18 mm. When this diameter falls below 12 mm–14 mm for any reason this is likely to cause stenosis and myelopathic symptoms. The average diameter of the spinal cord in the cervical region of the spine is 10 mm. The most common causes are congenital stenosis and degenerative stenosis caused by spondylosis. Other causes are Ossification of the Posterior Longitudinal Ligament (OPLL), compression by the presence of a tumour, compression by an epidural abscess, trauma or compression caused by cervical kyphosis. Cervical myelopathy can also be caused by neurological injury to the cord at the cervical level by ischaemic injury secondary to compression of the anterior spinal artery. Discogenic disease may cause myelopathy in the acute setting from a large central soft disc herniation causing cord compression. Disc disease is also often seen as part of the compressive lesion in spondylotic disease.

Cervical myelopathy is more common in men and also tends to present earlier in men than in women. Radiologically, spondylosis is present in 13% of men in the third decade and almost 100% of men over the age of 70. In women the disease presents later, with 5% showing radiographic changes in the fourth decade, increasing to 96% in women over the age of 70.¹ Changes are more common in patients with Rheumatoid Arthritis, where 85% of those with moderate to severe disease will have radiological changes.²

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When patients with cervical myelopathy present in the third or fourth decade of life the condition is usually secondary to congenital stenosis, and these patients are predisposed to the effects of spondylotic changes earlier, as there is congenitally less space in the canal to accommodate any compressing lesion. If it presents later in life, degenerative cervical spondylosis is usually the underlying cause, and in this case the pathology is termed Cervical Spondylotic Myelopathy (CSM).

Aetiology of cervical myelopathy

Congenital causes of cervical myelopathy

Myelopathy due to congenital stenosis does not have a specific underlying lesion. It is caused by a canal diameter that is narrower from birth. It is often not symptomatic until secondary degeneration further narrows the canal. If there is less room for the spinal cord, superimposed narrowing of the vertebral foramen is more likely to cause cord compression.

Congenital anomalies of the cervical spine (eg, Klippel–Feil syndrome, which is characterized by fusion of any two cervical vertebrae) can predispose to excessive spondylosis and CSM in later life.

Cervical spondylotic myelopathy

Cervical spondylosis is a general term for usually age-related wear-and-tear changes affecting the vertebrae, intervertebral discs, the facet joints and the associated ligaments. Cervical spondylosis is characterized by degeneration of these structures, often with the formation of bony spurs that arise from the vertebral body in response to degenerative changes in the disc and movement of adjacent vertebrae. Spurring can also accompany degeneration of the facet joints. Typically, cervical spondylosis affects multiple cervical spinal levels. The presence of degenerative change is very common in the general population and more frequent with increasing age. One study of 200 asymptomatic individuals showed degenerative changes at 1 or more levels on lateral neck X-rays in 95% of men and 70% of women by the age of 60–65 years.³ A study of cervical spine magnetic resonance imaging (MRI) in asymptomatic subjects showed that in subjects older than 40 years, 57% had disc degeneration or disc space narrowing at 1 or more levels, and 40% had bone spurs.⁴ The most common level of abnormality in patients of all ages was C5-6, and in descending order, C6-7 and C4-5. Another MRI study of the C2–7 disc levels of asymptomatic subjects showed degenerative changes of the cervical intervertebral discs in 86% of men and 89% of women over the age of 60.⁵ In this study, 7.6% of patients, mostly older than 50 years, had asymptomatic spinal cord compression. This study also showed the most common level of involvement was C5-6; then in decreasing order of frequency, C6-7, C4-5, C3-4 and C2-3.

CSM is the result of degenerative change that develops with age, including ligamentum flavum hypertrophy or buckling, facet joint hypertrophy, disc protrusion and posterior spondylotic ridges. One or all of these changes contribute to an overall reduction in canal diameter, which may result in cord compression. Spondylolisthesis usually occurs in the lower cervical spine. It is caused by arthrosis of the facet joints combined with disc degeneration leading to instability.⁶

Cervical spondylosis can be completely symptomless, it can cause neck and regional pain alone, or if the cervical nerve roots and/or spinal cord are affected it can cause referred pain into the upper extremities and neurologic dysfunction of the extremities, torso and sphincters. Factors that can lead to spinal and intervertebral foramen narrowing include disc degeneration and bulging, osteophyte formation, ligamentous hypertrophy, congenital or acquired spondylosis, decreased disc height, uncovertebral joint thickening and osteoarthritis of the facet joints (Figure 1).

Degenerative disc disease, with bulging and osteophytic spurring, causes an increase in the circumference of the vertebra at the level of the disc. These spondylotic bars encroach on the spinal canal and compress the spinal cord. Over time, spondylotic changes decrease the size of the vertebral and intervertebral foraminae. Cervical spondylotic myelopathy occurs when there is narrowing of the vertebral foramen at one or more levels with compression of the spinal cord. Although the primary mechanism of cervical spondylotic myelopathy (CSM) may be compression of nervous tissue, there is some evidence that ischaemia may also be a contributing factor.^{8,9}

'Adjacent segment' spondylotic disease

Surgical fusion can cause accelerated 'adjacent segment' spondylotic disease. Both congenital and iatrogenic fusions result in excessive motion at adjacent unfused spinal levels, which leads to accelerated spondylosis. For anterior cervical fusion, it has been estimated that symptomatic adjacent segment disease will occur in 2.9% of patients per year for the first decade after surgery.¹⁰

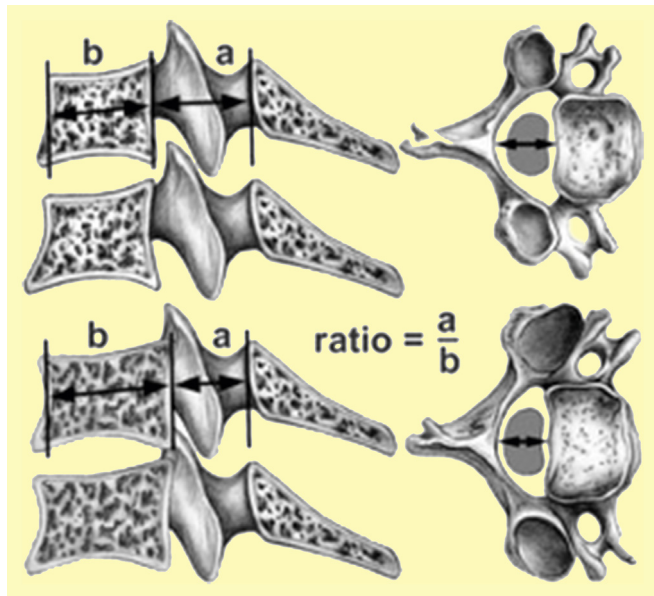


Figure 1 Torg's ratio (a/b) is a ratio between the sagittal diameter of the spinal canal (labelled a) and the sagittal width of the vertebral body (labelled b). A Torg's ratio of less than 0.8 denotes cervical stenosis. In the diagram seen above, the first two images represent a normal cervical spinal canal in sagittal and axial view and the second two images represent a congenitally stenosed cervical spinal canal in sagittal and axial views.⁷

Post traumatic myelopathy

When myelopathy is due to trauma, it is termed Spinal Cord Injury. Trauma may induce myelopathy or precipitate symptoms of an underlying stenosis of the spinal canal. Smaller diameter canals have an increased chance of neurological injury caused by trauma.¹¹

Ossification of the posterior longitudinal ligament

Ossification of the posterior longitudinal ligament (OPLL) is typically an entity found in patients of Asian descent, although it is seen in all ethnicities. It is characterized by, as the name suggests, ossification of the posterior longitudinal ligament. This is a common feature in patients with cervical myelopathy, with up to 25% being affected. It is seen on imaging as areas of ossification behind the vertebral bodies. The extent is best defined by CT (Figure 2).¹²

Myelopathy due to tumour expansion

Intraspinal tumours are a relatively uncommon cause of cervical myelopathy but must always be considered, given the potentially catastrophic consequences of the diagnosis being missed.

The spinal column is the most common site for bone metastasis. Estimates indicate that at least 30% and as many as 70% of patients with cancer will experience spread of their cancer to their spine. Common primary cancers that spread to the spine are lung, breast, and prostate. Lung cancer is the most common cancer to metastasize to bone in men, and breast cancer is the most common in women. Other cancers that spread to the spine include gastrointestinal tract, lymphoma, myeloma, melanoma, renal, sarcoma and thyroid.

Prompt diagnosis and identification of the primary malignancy is crucial to overall treatment. Numerous factors can affect outcome, including the nature of the primary cancer, the number of lesions, the presence of distant non-skeletal metastases and the presence and/or severity of spinal cord compression.

Intramedullary tumours are rare, accounting for only 5–10% of all spinal tumours. Benign tumours such as meningioma and neurofibroma account for 55–65% of all primary spinal tumours. Metastatic spinal tumours are the most common type of malignant lesions of the spine, accounting for an estimated 70% of all spinal tumours. Table 1 contains a list of tumours that can cause myelopathic symptoms by compression of the cord.

Epidural abscess

An epidural abscess is defined as a collection of pus or inflammatory granulation tissue between the dura mater and surrounding adipose tissue. It is usually seen in adults over the age of 60 years. Risk factors include intravenous drug abuse, immunodeficiency, malignancy, HIV, immunosuppressive medications or a recent spinal procedure. An abscess can form following haematogenous spread from another site of infection, direct spread from discitis or following surgical intervention at the cervical level. The most common pathogens are *Staphylococcus aureus* most commonly (50–65%) and gram-negative infections such as *Escherichia coli* (18%). *Pseudomonas* is seen in patients with intravenous drug abuse and *Mycobacterium tuberculosis* in the developing world. Symptoms can be caused by direct compression or infarction of spinal cord blood flow. An epidural

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