Brown-Séquard's Syndrome

Brown-Séquard's syndrome results from a lesion in one (lateral) half of the spinal cord (for example, hemisection or lateral injury of the cord). It often occurs in the cervical cord region. It was first described in the 1840s by Dr Charles-Édouard Brown-Séquard (1817-94).[1] The syndrome is rare and comprises ipsilateral hemiplegia with contralateral pain and temperature sensation deficits (because of the crossing of the fibres of the spinothalamic tract).

Pathophysiology

The pure Brown-Séquard's syndrome reflecting hemisection of the cord is rarely seen. However, a clinical picture with some of the features of the syndrome is more common. The hemisection syndrome may also occur with additional symptoms and signs. Interruption of the lateral corticospinal tracts, the lateral spinothalamic tract, and occasionally the posterior columns clinically causes a spastic weak leg with brisk reflexes and a strong leg with loss of pain and temperature sensation. Spasticity and hyperactive reflexes may not be present with an acute lesion.

Aetiology

The causes of this syndrome are:

- Most commonly, trauma (penetrating or blunt).[2]
- Neoplasia (spinal cord tumour - either metastatic or primary).
- Multiple sclerosis.
- Degenerative (such as herniation of discs and cervical spondylosis).[3, 4]
- Cysts and cystic diseases.[5]
- Idiopathic spinal cord herniation.[6] (Spinal cord herniation can also occur after trauma.)[7]
- Vascular causes:
  - Haemorrhage (including spinal subdural/epidural and haematomyelina).
  - Ischaemia.
- Infectious causes: eg, meningitis, empyema, herpes zoster virus, herpes simplex virus, tuberculosis, syphilis.
- Other causes: include gnathostomiasis (helminthic parasitic disease), and tropical spastic paraplegia (HTLV-1).
- Rollercoaster riding and chiropractic manipulation may be a contributing factor if there is a predisposition (such as a cyst).[8]

Presentation

See also the separate article on Neurological History and Examination.

- There is a total ipsilateral loss of position, light touch and vibration sensation at the level of the lesion.
- There is contralateral loss of pain and temperature beginning a few segments below the lesion (because the spinothalamic tracts enter the cord and travel ipsilaterally for a few segments before decussating). No plantar response on this side because of loss of pain sensation.
- There is ipsilateral spastic paraparesis with loss of vibration and joint-position sense (destruction of ipsilateral dorsal column fibres) below the lesion. Reflexes are brisk with upgoing plantar reflex.
- There may be an ipsilateral Horner's syndrome if the sympathetic fibres are damaged (in the neck).
- There are also sphincter disturbances.
- Incomplete forms of the syndrome commonly occur, usually caused by vascular impairment secondary to compression of the cord, with sparing of the dorsal columns (separate vascular supply); or inflammatory lesions (for example, multiple sclerosis).

Differential diagnosis

Diagnosis of Brown-Séquard's syndrome is made on the basis of the presenting history and examination. Most cases will be caused by trauma. It is important when there is no history of trauma to consider:

- Multiple sclerosis.
- Spinal cord injury and compression.
- Stroke.
- Spinal tumours.

Investigations
Laboratory studies may be useful with non-traumatic causes. Overall they are not usually necessary for diagnosis. They may be useful in considering the differential diagnosis and for monitoring the clinical course.

**Imaging**
- Spinal plain radiographs (for bony injury in penetrating or blunt trauma).[^9]
- MRI scanning can help to define the extent of spinal cord injury. It is particularly helpful when evaluating non-traumatic causes. MRI may be needed in traumatic cases when there is neurological deterioration.[^10]
- CT myelography (useful if MRI is contra-indicated).

**Management**
- Initially, a thorough evaluation, including neurological examination, is performed to establish the level of injury.
- Careful cervical spine/dorsal spine immobilisation is necessary.
- No movement of the neck should be permitted.
- It is important to identify cases (such as spinal cord herniation) where surgical intervention can improve prognosis.[^11, 12]

**Complications**
Early and late complications associated with spinal injury may occur. These may include:
- Hypotension (‘spinal shock’).
- Pulmonary embolism (prophylaxis needed).
- Infection (lungs, urine, etc).
- Depression (common with spinal cord injuries).

**Prognosis**
The prognosis for Brown-Séquard's syndrome is generally poor although it may be better than other forms of spinal cord injury.[^13] Aetiology can have a bearing on prognosis.

**Historical footnote[^1]**
Charles-Édouard Brown-Séquard (1817-94) was a very remarkable and eminent neurologist who worked in England, France and the USA. He was one of the founding physicians at the Institute of Neurology in London. He published 577 papers. He initially intended to be a writer, but became a medical student when his manuscripts were rejected repeatedly. He first published the findings which became ‘Brown-Séquard's syndrome’ in 1849 and he later described a typical case of his syndrome to the British Medical Association's annual meeting in 1862 - that of a sea captain stabbed in the neck. He also performed notable work in the emerging field of endocrinology.
Further reading & references


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