



Case Report

# Acute Brown-Séquard Syndrome Caused by Cervical Prolapsed Intervertebral Disc: First Reported Local Case and Literature Review

## 頸椎椎間盤突出引起的急性脊髓半切綜合症:首先本地個案報導和文獻綜述



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### ARTICLE INFO

*Article history:*

Received 29 June 2016

Received in revised form

2 September 2016

Accepted 16 September 2016

*Keywords:*

anterior cervical fusion

Brown-Séquard syndrome

cervical disc herniation

discectomy

### ABSTRACT

Cervical prolapsed intervertebral disc is a common pathology that may have a wide range of presentations, from incidental finding on imaging to neck pain to different neurological symptoms. Brown-Séquard syndrome is a rare presentation of cervical disc prolapse but it usually carries a good prognosis for recovery. We present an uncommon case of C3/4 cervical prolapsed intervertebral disc causing acute Brown-Séquard syndrome, the first-ever reported in the local literature.

### 中文摘要

頸椎間盤突出是常見的病症,其症狀很廣泛,從造影上偶然發現,頸部疼痛,到不同的神經症狀都有。脊髓半切綜合症是頸椎間盤脫出的罕見表現,但通常有良好的復原後果。我們首次在文獻報導一例本地出現的C3/4頸椎間盤突出引起急性脊髓半切綜合症的病例。

### Introduction

Brown-Séquard syndrome is an incomplete spinal injury first described in 1849<sup>1</sup> in a clinical case with penetrating traumatic insult to the anatomical hemicord. Typical clinical presentations are ipsilateral paralysis and impaired sensation to vibration and proprioception together with contralateral impaired sensation to temperature, touch, and pain.

Common causes of Brown-Séquard syndrome are penetrating trauma and tumour. Cervical prolapsed intervertebral disc is a rare cause, with the first case reported in 1928.<sup>2</sup> To date, only around 50 cases have been reported in the worldwide literature, with only a few case series available.<sup>3</sup>

We report a case of Brown-Séquard syndrome caused by cervical prolapsed intervertebral disc; the first case ever reported in Hong Kong.

### Case report

A previously healthy 27-year-old gentleman presented with a 3-week history of neck pain of spontaneous onset. Symptoms

worsened on the day of admission after a jerky neck movement while he was driving, followed by the development of incomplete right hemiparesis.

He was initially admitted into the medical ward for suspected cerebrovascular accident as he presented with a sudden onset of hemiparesis.

Upon admission, the right-sided C5, C6, L2, and L3 myotomes were graded at 4/5 on the Medical Research Council (MRC) scale for muscle power, while the other right-sided myotomes were graded 3/5. The sensation over the right side of the body and limbs was normal. Over the left side, there was impaired sensation to touch and pain from the T3 dermatome downwards with severe sensory loss. There was no dysfunction of bowel or bladder.

Rapid clinical deterioration was observed over 6 hours, especially noted over the right upper limb. C7 myotome power decreased to 1/5, while C8 and T1 myotome power deteriorated to 2/5.

Computer tomography of the brain showed no abnormalities.

Magnetic resonance imaging (MRI) showed a prolapsed intervertebral disc with annular tear and sequestration of the nucleus at the C3/4 level with compression of the cord, more on the right side. Posterior disc prolapse was also noted in the C4/5 level with no cord compression (Figures 1 and 2).

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Emergency anterior decompression and fusion were performed on the day of admission.

Anterior decompression was carried out with a Southwick–Robinson approach with a transverse skin incision, followed by C3/4 discectomy under loupe magnification. An autogenous tricortical bone graft was obtained from the anterior iliac crest for spinal fusion without instrumentation. A Philadelphia collar was used during the early postoperative period for protection of the fusion.

The course of rehabilitation was uneventful. The patient's power normalised on postoperative Day 8 and his sensation showed slow but gradual improvement. He was discharged on postoperative Day 18 after a short intensive course of physiotherapy.

He returned to work 3 weeks after the operation. Serial radiographs showed solid fusion over C3/4 (Figure 3). After 5 years of follow-up, the only residual symptom was impaired sensation to temperature in the left thigh with no functional deficit.

The motor recovery was complete, with sensory recovery S4 (complete recovery) in most dermatomes using MRC grading and S3+ (some 2-point discrimination) over the left L2 dermatome.

There is no disease-specific assessment tool for the neurological deficit in Brown-Séquard syndrome or in cases of cervical prolapsed intervertebral disc. The Japanese Orthopaedic Association (JOA) score was used to compare the function during acute presentation and after neurological recovery reached a plateau. The JOA score was 5/17 before the operation and reached 16/17 after recovery.

## Discussion

The unique clinical presentation of Brown-Séquard syndrome is caused by disruption of tracts in the hemicord. Disrupted tracts are (1) the lateral corticospinal tracts causing paralysis, (2) the dorsal columns causing impaired sensation to vibration and proprioception, and (3) the lateral spinothalamic tract causing impaired sensation to temperature, touch, and pain.

The corticospinal tract and the dorsal columns decussate at the level of the medulla and thus the ipsilateral side is affected but the contralateral side is spared.



Figure 1. Preoperative MRI showing prolapsed intervertebral disc at the C3/4 level.

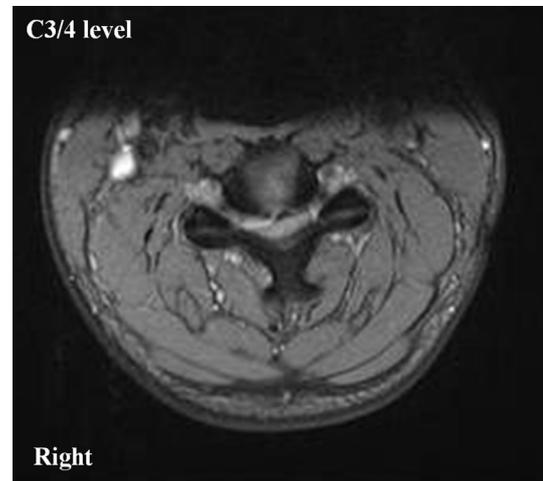


Figure 2. Preoperative MRI showing prolapsed intervertebral disc with compression of the cord.



Figure 3. Postoperative radiograph showing solid fusion of C3 and C4 vertebrae.

On the contrary, the fibres of the lateral spinothalamic tract decussate at the level of the spinal cord. Dependent modalities of sensation are impaired on the contralateral side but preserved on the ipsilateral side. Further, as the spinothalamic tract decussates one to two segments distal to the entry level, the level of impairment in temperature, touch, and pain is commonly seen a few levels distal to the level of injury.

The first case report of Brown-Séquard syndrome was caused by penetrating trauma. At the cervical level, other aetiologies reported included blunt trauma, tumour, spinal cord ischaemia, spontaneous epidural haematoma, and cervical ossification of the posterior longitudinal ligament.<sup>4</sup>

It was agreed by all authors of previously reported cases that Brown-Séquard syndrome caused by cervical prolapsed intervertebral disc was an uncommon condition.

To our knowledge, there have been 53 cases reported in the English language literature to date, with patients' age ranging from 23 to 73 years, the majority of whom were male. Most cases involved only one spinal level with seven cases involving two consecutive levels and two cases involving multiple levels.<sup>3,5–7</sup> Of the 83% of cases involving only one level, C5/6 is the most commonly involved.<sup>4</sup>

Typical presentation of Brown-Séquard syndrome is rare based on the variation of culprit lesions and their insults to the cord. In our reported case, the sensation of vibration and proprioception were preserved, which might be explained by the anterior compression that spared the dorsal columns.

Clinically, the diagnosis of Brown-Séquard syndrome may be confused with hemiplegia as a result of cerebrovascular accident, as exemplified by the present case. Our patient was initially thought to be suffering from stroke and was hence admitted to the medical unit. Moreover, the acute onset of neurological symptoms may further resemble the presentation of stroke. In order to avoid delay in diagnosis, detailed neurological examination and imaging when in doubt are mandatory.

MRI is the standard investigation for diagnosis and surgical planning.

Surgical management was employed in all reported cases and the anterior approach with or without fusion was the choice of approach in most cases (70%).

Clatterbuck et al reported better recoveries in patients with decompression through the anterior approach than those with decompression through the posterior approach.<sup>8</sup> Choi et al recommended anterior discectomy or corpectomy with fusion as it enabled good exposure, decompression, and direct tackling of the pathology.<sup>4</sup> Abouhashem et al recommended laminectomy with or without discectomy for early cases and anterior discectomy with or without fusion for late cases in a series of seven cases.<sup>3</sup>

Brown-Séquard syndrome has the best prognosis of recovery among all patterns of incomplete cord injury. In cases with cervical prolapsed intervertebral disc as the cause, 62% were reported to have complete recovery and only 9% showed no neurological recovery.<sup>3,5–7</sup>

Most reports, including the largest case series so far, showed a high chance of rapid progressive course as in our case. Early decompression was recommended by all authors, although there was no significant correlation noted between the neurological outcomes and the duration of symptoms.<sup>3</sup>

Urrutia and Fadic reported a case of rapid neurological deterioration associated with cervical extension during preoperative positioning as documented by neuromonitoring.<sup>9</sup> They also recommended the use of intraoperative neuromonitoring as a tool to

preserve neurological function. So far, there are insufficient cases to prove the usefulness of this tool in altering outcomes.

## Conclusion

Cervical prolapsed intervertebral disc is an uncommon cause of Brown-Séquard syndrome. The diagnosis may be delayed as classical presentation is rare. Early detection with high index of clinical suspicion, detailed neurological examination, and MRI allow prompt recognition. Early surgical decompression with anterior approach gives a favourable outcome.

## Conflicts of interest

The authors have no affiliations with or involvement in any organisation or entity with any financial interest, or non-financial interest in the subject matter or materials discussed in this manuscript.

## Funding/support

No financial or grant support was received for the work described in this article.

## References

1. Brown-Séquard CE. De la transmission croisée des impressions sensibles par la moelle épinière. *C R Soc Biol* 1849;1:192–4.
2. Stookey B. Compression of the spinal cord due to ventral extradural cervical chondromas: diagnosis and surgical treatment. *Arch Neurol Psychiatr* 1928;20(2):275.
3. Abouhashem S, Ammar M, Barakat M, Abdelhameed E. Management of Brown-Séquard syndrome in cervical disc diseases. *Turkish Neurosurg* 2012;23(4):470–5.
4. Choi KB, Lee CD, Chung DJ, Lee SH. Cervical disc herniation as a cause of Brown-Séquard syndrome. *J Korean Neurosurg Soc* 2009;46(5):505–10.
5. Ghasemi AA. A rare case of Brown-Séquard syndrome caused by cervical disc herniation: a case report. *J Inj Violence Res* 2012;4(3 Suppl. 1):82.
6. Wang D, Wang H, Shen WJ. Spontaneous cervical intradural disc herniation associated with ossification of posterior longitudinal ligament. *Case Rep Orthop* 2014;2014:256207.
7. Guan D, Wang G, Clare M, Kuang Z. Brown-Séquard syndrome produced by calcified herniated cervical disc and posterior vertebral osteophyte: case report. *J Orthop* 2015;12:S260–3.
8. Clatterbuck RE, Belzberg AJ, Ducker TB. Intradural cervical disc herniation and Brown-Séquard's syndrome: report of three cases and review of the literature. *J Neurosurg Spine* 2000;92(2):236–40.
9. Urrutia J, Fadic R. Cervical disc herniation producing acute Brown-Séquard syndrome: dynamic changes documented by intraoperative neuromonitoring. *Eur Spine J* 2012;21:418–21.