


# Failure of Surgical Equipoise in Posterior Cord Syndrome Myelopathy

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## ABSTRACT

We suggest that a clinical diagnosis of posterior cord syndrome indicates primary posterior decompression in cervical spondylotic myelopathy cases. We present two unique cases of failed anterior decompression in neutrally aligned necks with compressive myelopathy and a literature review. Two recent cases of cervical spondylotic myelopathy that failed to respond after anterior surgical decompression and fusion surgery were observed at our institution. Both patients had motor strength preservation but were unable to stand and walk independently and had other clinical findings consistent with posterior cord syndrome rather than the more common anterior or central cord syndromes, and both responded well to staged posterior decompression. Posterior cervical decompression successfully relieved posterior cord syndrome symptoms after a failed anterior decompression in both of our cases. Posterior cord syndrome is a rare syndrome best diagnosed clinically and should be considered in cases of cervical spondylotic myelopathy in which motor strength testing is preserved.

**C**ervical spondylotic myelopathy (CSM) is increasingly common<sup>1</sup> and when presenting motor functional impairments and decreased quality of life, it is recognized to be a primarily surgical disease with consistent benefit to be had from timely decompression.<sup>2,3</sup>

There is a wide spectrum of options in surgical decompression, generically including anterior and posterior approaches. Although many cases can dictate a preferred direction of approach as a function of case-specific pathoanatomy, in those presenting with preserved cervical lordosis and without ossification in the posterior longitudinal ligament, the literature defines equipoise in surgical approach as anterior versus posterior options generally providing equal benefit.<sup>4</sup>

Spinal cord injury syndromes include anterior cord syndrome, central cord syndrome, posterior cord syndrome (PCS), and lateral (Brown-Sequard)<sup>5,6</sup> injuries. Most of these cases are anterior or central cord syndromes. The frequency of posterior and lateral injuries are recognized to be in the low single digits.<sup>7-9</sup>

Literature on the surgical care of CSM does not commonly differentiate the outcome by the cord syndrome involved, and so at the current state of practice

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**Figure 1**

Case 1; Preoperative MRI.

evidence, it remains professionally acceptable to treat a posterior cord syndrome anteriorly.<sup>10,11</sup>

A recent publication from Korea<sup>12</sup> found that posterior indentations of the cord from ligamentum flavum hypertrophy were not consistently relieved by anterior surgery and so that pathoanatomy argues for a posterior approach.

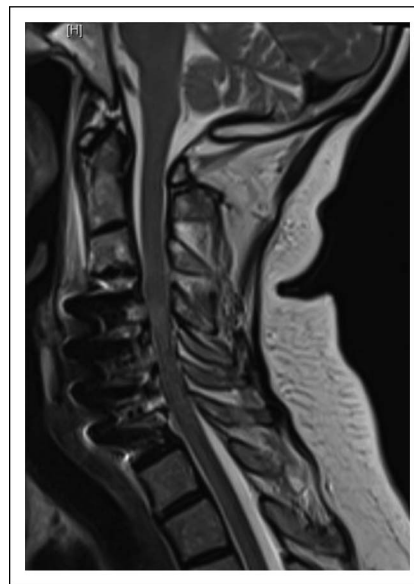
Both patients reported here have given written permission for the presentation of their case details and imaging.

## Case Presentations

### Case 1

A 60-year-old woman comorbid with controlled hypertension, bipolar disorder, anxiety, and alopecia had a baseline multiyear history of nondisabling neck and low back pain for which she would periodically see a chiropractor. Shortly after a clinically successful treatment for neck pain relief she noted new symptoms of dizziness, light-headedness, and poor balance with a tendency to drag the right leg that progressed over 1 month to her wall-walking in the home, inability to navigate stairs, and using a walker outside the home.

She self-referred to her local emergency room where a history of numbness and tingling in the hands with loss of fine motor control bringing difficulty in toothbrushing and dressing was elicited. Radiographs and CT scan showed diffuse degenerative change without deformity, and she was referred to the local amyotrophic lateral sclerosis clinic.

**Figure 2**

Case 1; MRI after primary anterior surgery.

At the amyotrophic lateral sclerosis clinic, physical examination found bilateral positive Hoffmann sign and bilateral clonus. A cervical spine MRI confirmed spondylotic cord compression (Figure 1) and prompted referral to a spine surgeon.

A spine surgeon found her American Spine Injuries Association motor index score to be 96 with the only deficiency being weakness in right hip flexion where there was a history of arthritis pain. She was admitted and booked on the urgent inpatient surgery list for anterior cervical decompression and fusion C4-C7.

Postoperatively, there was no change in her neurological status whatsoever. At reassessment, a consultant confirmed generally good strength and the American Spine Injuries Association score but found she could not perform rapid digital opposition to all the lesser fingers and was able to correctly report only three of 10 trials in passive elevation/depression of the great toes. The clinical diagnosis was PCS. On POD#6, MRI was repeated (Figure 2), confirming that posterior compression of the cord remained unchanged despite some decompression anteriorly.

The patient was returned to the operating room for multilevel cervical laminectomy C4-7.

After the second surgery, there was immediate major relief of neurological symptoms and improved manual dexterity and mobility. Baseline deficits were such that the patient required convalescent transfer to her local hospital. Outpatient Spinal Cord Rehabilitation facilitated her eventual discharge home with stable gait and functional independence.

**Figure 3**

Case 2; Preoperative MRI.

**Case 2**

A 64-year-old man comorbid with controlled hypertension, mild chronic obstructive pulmonary disease and obstructive sleep apnea managed with continuous positive airway pressure was an independent and vigorous retiree.

Six months before presentation, he began to see a chiropractor for neck pain and stiffness with little benefit. Three months later, he spent an afternoon trimming tall trees at his home, the work requiring his neck to be extended continuously as he looked upwards doing the work. Neck pain increased, and there was new numbness, tingling, and poor dexterity in the left upper extremity that rapidly progressed to involve all four limbs. There was report of occasional tremor in the arms, which was not observed. He was unable to stand without falling and took to a wheelchair.

At his local ER, a stroke workup was negative, and radiographs of the neck showed advanced multilevel disk degeneration without kyphosis or imbalance. He was referred to a neurologist who found signs of cervical myelopathy, ordered a confirmatory MRI (Figure 3), and referred the patient to the spine clinic.

At the spine clinic, the bedside examination found normal strength throughout, with an inverted radial reflex on the left but no other signs of spasticity. The limbs were flaccid and deep tendon reflexes absent. Rapid digital opposition was impossible, and he could not identify the position of his great toes at all when they were manipulated up or down by an examiner. He could

**Figure 4**

Case 2; MRI after primary anterior surgery

stand erect from a chair with difficulty but was profoundly unsteady and would have fallen without support in even the first step. The gait was wide-based and slow-paced, without spasticity or scissoring. There was no Trendelenburg lurch or drop-foot.

For clinical PCS, he was admitted and placed on the urgent inpatients surgical list for posterior surgical decompression and fusion C2-C5.

The next day, the operating on-call surgeon voiced equipoise on the MRI and performed anterior surgical decompression and fusion C3-5.

Postoperatively, symptoms and disability were increased with coarsening of baseline intention tremor in any mobilization of the arms. The patient could not feed himself. Motor strength remained uniformly normal. Inpatient spinal cord rehabilitation was ineffective. A repeat MRI (Figure 4) showed cord compression to have been unchanged by the anterior surgery.

The patient was returned to the operating room for cervical laminectomy C3 and C4.

After the second surgery, there was immediate relief of intention tremor and extremities dysesthesia with improved manual dexterity and balance. After a short period of inpatient spinal cord rehab, he was discharged home with rapidly improving functional capacity and is now independently mobile.

## Discussion

The kinetics of symptom evolution and functional deterioration with CSM are highly variable, and correlations between the degree of cord compression and symptom severity were poor.<sup>11</sup> Acutely deteriorating patients often have only chronic changes seen in their scans, as seen here. Deterioration in the first case was likely precipitated by chiropractic care and in the second by extended extensile posture of the neck “draping” the cord over a posterior-dominant compression.

In both cases, the baseline examination found good preservation of motor strength but poor manual dexterity in rapid digital opposition and poor appreciation of great toes proprioception. Balance was badly compromised, and both patients were essentially unable to stand and walk despite normal strength in the legs to the manual motor examination.

PCS is not a failure of power, as are found in the anterior and central cord syndromes, but of control. Injury to the posterior columns leads to notable functional impairment.

PCS involves a selective lesion to the posterior columns of the spinal cord, resulting in a loss of proprioception and vibration distal to the level of the lesion. Patients present with sensory ataxia and a loss of balance. Our sense of balance coalesces from a triad of inputs: visual, vestibular, and proprioceptive. Loss of two of these markedly impairs the patient’s sense of balance, and patients often present with a history of falls. Although a large dorsal cord lesion may compromise the lateral corticospinal tracts,<sup>6</sup> a diagnosis of PCS requires preserved muscle strength and temperature and pain sensations.

At the bedside, a patient history of falls with preserved motor strength in the limbs should prompt concern to this rare diagnosis. Both of our patients had strong handgrip but great difficulty in rapid alternating digital opposition and highly inaccurate great toes proprioception. Sensorimotor neuropathy may be a con-

founder, and electrophysiological studies of the limbs may be of value in care planning.

## Conclusion

PCS may be a factor in clinical failure after anterior decompressive surgery for CSM.

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