Cervical Myelopathy without Symptoms in the Upper Extremities: Incidence and Presenting Characteristics

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BACKGROUND: **Common signs and symptoms of cervical myelopathy (CM) predominantly manifest in the upper extremities and include hand numbness, hand clumsiness, and distal upper extremity weakness. CM manifesting without symptoms in the upper extremities is rare. This study aimed to better understand the incidence and character of such cases.**

METHODS: **A retrospective review of surgeries for CM from disc herniation, spondylosis, or ossification of posterior longitudinal ligament over a 12-year period was performed to identify patients presenting without symptoms in the upper extremities.**

RESULTS: **Of 982 surgically treated patients with CM, 12 (1.2%) had no upper extremity symptoms. All had difficulty ambulating, and 7 of 12 (58%) patients had objective lower extremity weakness. Ten (83%) patients had a history of lumbar degenerative disease. On sensory examination, 4 (33%) patients had a discernible midthoracic pin level, 3 (25%) had loss of sensation from the upper leg and genital area down, and 2 (17%) had only genital/upper thigh area sensory loss. All patients demonstrated neurologic improvement after decompressive surgery.**

CONCLUSIONS: **Patients with CM may rarely present without symptoms in the upper extremities, presenting with numbness perceived from the upper trunk, waist area, or perineum and legs in addition to leg weakness and gait difficulty. All patients had cervical cord compression at either C5-6 or C6-7 level, accounting for 1% of all patients undergoing cervical surgery. Awareness of this atypical pattern of presentation may aid in clinical assessment of a subset of patients with cervical cord compression.**

INTRODUCTION

Cervical myelopathy (CM) from spondylosis, disc herniation, and ossification of posterior longitudinal ligament produces neurologic symptoms that tend to follow a typical pattern with many patients most commonly presenting with symptoms in the upper extremities, particularly hand numbness and hand clumsiness.[1-4] Symptoms referable to the lower extremities, including weakness, numbness, and pain, may be reported but are typically encountered when coexisting symptoms are also present in the upper extremities. CM manifesting entirely without symptoms in the upper extremities is rare, and the incidence and character of such presentations are not well described.[1-4] We retrospectively reviewed surgically managed cases of CM to identify and study the characteristics of a small subgroup of patients who presented with no symptoms referable to the upper extremities.

MATERIALS AND METHODS

After institutional review board approval, we retrospectively reviewed the records of consecutive patients who underwent surgical treatment for CM from disc herniation, spondylosis, or ossification of posterior longitudinal ligament over a 12-year period and identified patients presenting without symptoms in the upper extremities, including hand sensory abnormalities, hand clumsiness, and arm and/or hand weakness. Individual

Key words
- Cervical myelopathy
- Cervical spine surgery
- False localizing sign
- Neurologic examination
- Presenting symptoms
- Sensory level
- Spinal cord

Abbreviations and Acronyms
CM: Cervical myelopathy
MRI: Magnetic resonance imaging

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patient consents were not required owing the anonymized, retrospective design of the study.

Demographic data and clinical characteristics of patients were analyzed. Data collected included patient age, sex, presence of diabetes, body mass index, and surgical levels. Chart notes were reviewed with particular attention to the narrative descriptions of the history and character of presenting symptoms in addition to the patient-completed diagrams of symptom location. Data for this study group were compared with data for all other patients undergoing cervical spine surgery during the same time period. Statistical analysis was performed using commercially available software (GraphPad Prism 4; GraphPad Software, San Diego, California, USA) using the Fisher exact test with $P < 0.05$ considered statistically significant.

RESULTS

Of 982 patients treated, 12 (1.2%) had no symptoms in the upper extremities; 8 were men and 4 were women with a mean age of 54 years (range, 40–76 years). Follow-up data for a minimum of 12 months were available for all patients presenting without upper extremity symptoms and 743 of all other 970 (77%) cases. Patients presenting with no upper extremity symptoms were younger and trended toward a shorter duration of symptoms. Eleven of 12 (92%) patients reported difficulty ambulating, and 7 of 12 (58%) patients had objective lower extremity weakness in at least 1 muscle group. Weakness, when present, was reported in the iliopsoas muscle in 2 (16%) patients, in the quadriceps in 0 (0%) patients, in dorsiflexion in 6 (50%) patients, and in plantar flexion in 2 (16%) patients. Ten of 12 (83%) patients had initially been treated for lumbar degenerative disease before diagnosis. On sensory examination, 8 (75%) patients had sensory loss: 4 (33%) had discernible midthoracic pin level, 3 (25%) had loss of sensation from the waist area down, and 2 (12%) had genital area and upper thigh sensory loss as the only sensory symptom. Three (25%) patients had lower extremity hyperreflexia, 2 (17%) patients had a Hoffmann sign, and 1 (8%) patient had a Babinski sign. Imaging demonstrated cord compression from either spondylosis or soft disc at C6-7 in 6 patients, at C5-6 in 5 patients, and at both C4-5 and C5-6 in 1 patient (Figure 1). No patient experienced urinary dysfunction, but 6 of 8 (75%) male patients reported erectile dysfunction. All patients demonstrated neurologic improvement after decompressive surgery. Presenting patient data are summarized in Tables 1 and 2.

Illustrative Cases

Case 1. A 64-year-old man (patient 2 in Table 1) with a history of a C4-6 anterior cervical discectomy and fusion 8 years previously presented with a 6-month history of gradually worsening symptoms of bilateral leg pain and subjective sense of difficulty walking and ascending stairs. He had been treated by a pain management physician with a course of physical therapy and 3 epidural steroid injections, but without clinical response. Magnetic resonance imaging (MRI) of the lumbar spine (not shown) showed mild degenerative changes with mild L4-5 stenosis. Neurologic examination demonstrated weakness of 4+/5 in the left iliopsoas and upper thoracic level to pin sensation. Deep tendon reflexes were normal in the upper extremities but were subtlety enhanced at the knees. The toes were downgoing, but there was a positive Hoffmann sign on the left. MRI of the cervical spine (Figure 1) demonstrated disc herniation with cord compression at C6-7. Symptoms improved following C6-7 anterior cervical discectomy and fusion.

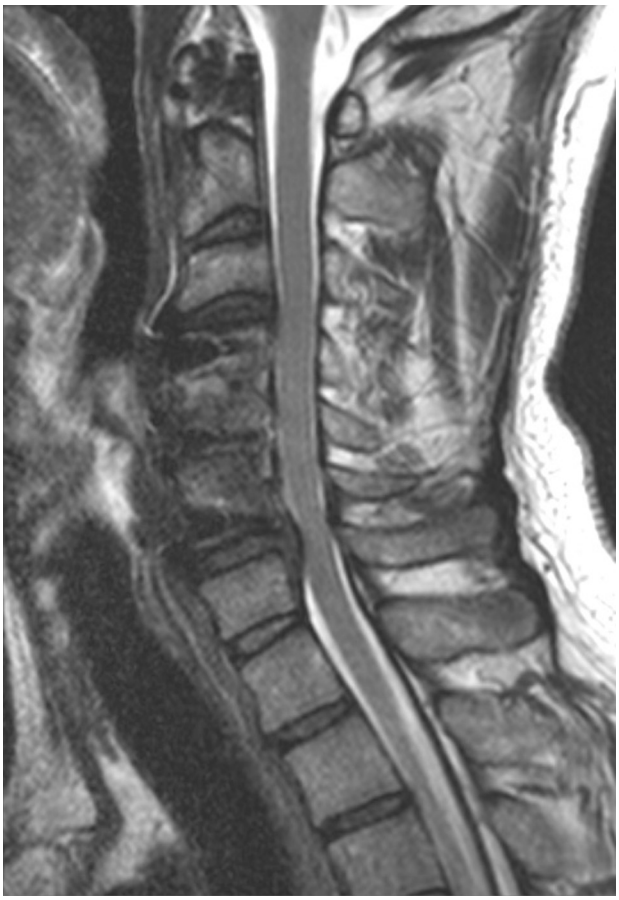

Figure 1. Sagittal T2-weighted magnetic resonance imaging of the cervical spine in a 64-year-old man with a previous history of C4-6 anterior cervical discectomy and fusion presenting with symptoms of leg pain and a subjective sense of difficulty walking. Neurologic examination revealed an upper thoracic pin level, a subtle increase in knee deep tendon reflexes, and a unilateral Hoffmann sign, showing a disc herniation at C6-7 producing spinal cord compression. Symptoms were relieved following C6-7 anterior cervical discectomy and fusion.

Case 2. A 42-year-old man (patient 10 in Table 1) presented with a 3-month history of worsening left leg pain, left foot weakness, and difficulty walking. MRI of the lumbar spine (Figure 2A and B) showed a large L4-5 disc herniation that was central and slightly to the left, migrating slightly down behind the L5 vertebral body. Neurologic examination demonstrated weakness of the left foot dorsiflexion and extensor hallucis longus of 4+/5 with no discrete dermatomal sensory loss. Deep tendon reflexes were 2+ and symmetric throughout, and Hoffmann and Babinski signs were absent. Straight leg raise and hip external rotation maneuvers were not provocative. He was admitted to the hospital for intravenous

Table 1. Clinical Features of Patients Presenting with Cervical Myelopathy without Symptoms in Upper Extremities

Patient	Age (Years)/Sex	Numbness Level	Weakness	Hoffmann Sign	Babinski Sign	Knee Hyperreflexia	Pathology
1	45/M	Upper thoracic	None	No	Yes	No	C5-6 disc herniation
2	64/M	Upper thoracic	None	Yes	No	Yes	C6-7 disc herniation
3	56/M	None	Dorsiflexion	No	No	No	C5-6 disc herniation
4	51/M	Waist	None	No	No	No	C6-7 spondylosis
5	48/F	Genital/inner thigh	Dorsiflexion	No	No	No	C6-7 disc herniation
6	70/M	Upper thoracic	Iliopsoas, dorsiflexion	Yes	No	No	C4-5 and C5-6 spondylosis and OPLL
7	40/M	None	None	No	No	No	C6-7 disc herniation
8	76/F	Waist	Dorsiflexion	No	No	No	C6-7 spondylosis
9	60/F	None	None	No	No	Yes	C5-6 spondylosis
10	42/M	Genital/inner thigh	Dorsiflexion	No	No	No	C5-6 disc herniation
11	53/M	Waist	None	No	No	No	C6-7 spondylosis
12	48/F	Upper thoracic	Iliopsoas, dorsiflexion	No	No	Yes	C5-6 disc herniation

M, male; F, female; OPLL, ossification of posterior longitudinal ligament.

steroid treatment, but after 3 days, there was no improvement. He underwent a left L4-5 microdiscectomy without complication. Following the surgery, he experienced worsening weakness in the left foot dorsiflexion and the appearance of mild dorsiflexion weakness on the right side, and he noted slight numbness in the genital and inner thigh area. Follow-up MRI (Figure 2C and D) demonstrated a left L4 laminotomy defect and interval removal of the extruded disc; however, there was some persisting central disc bulging with more foreshortening of the L4-5 disc space producing bilateral foraminal narrowing. An L4-5 transforaminal lumbar interbody fusion procedure was performed without intraoperative complication or monitoring changes. In the days following this procedure, however, the symptoms of genital and inner thigh numbness worsened, and the dorsiflexion weakness progressed to 3/5 bilaterally. Imaging of the entire spine revealed a C5-6 disc herniation producing severe spinal cord compression and T2 cord change (Figure 3A). The symptoms and neurologic deficits entirely resolved following anterior cervical discectomy and fusion at C5-6 (Figure 3B).

Case 3. A 45-year-old man (patient 1 in Table 1) presented with dragging of the right foot but no upper extremity symptoms. Neurologic examination was normal in the upper extremities, but there was 4−5 right dorsiflexion weakness and upper thoracic sensory level and a right Babinski sign. MRI demonstrated multilevel stenosis but focally significant cord compression at C5-6 from spondylosis with a superimposed disc herniation eccentric to the right (Figure 4).

DISCUSSION

The prevalence of upper extremity symptoms from cervical spinal cord compression was recognized early in the history of spinal surgery. In a 1949 report, Bucy and Heimburger[5] described "paresthesias in the hands with little objective change anywhere else." In 1952, Spillane and Lloyd[6] described symptoms of hand numbness that may precede gait-related symptoms in association with osteoarthritic disease of the spine. Following the advent of MRI to evaluate cases for potential surgical treatment, Good et al.[7]

Table 2. Clinical and Outcome Data for Patients Treated for Compressive Cervical Myelopathy with and without Upper Extremity Symptoms

	Cervical Myelopathy without Upper Extremity Symptoms (n = 12)	All Other Patients (n = 970)	P Value
Age, years, mean	54.4	62.1	0.026
Sex, M/F, number	8/4	449/521	0.159
Diabetes, number (%)	1 (8)	135 (14)	0.511
Duration of symptoms, months, mean (range)	5.8 (1−12)	15.1 (0−110)	0.069
BMI, mean	26.0	28.1	0.683

M, male; F, female; BMI, body mass index.

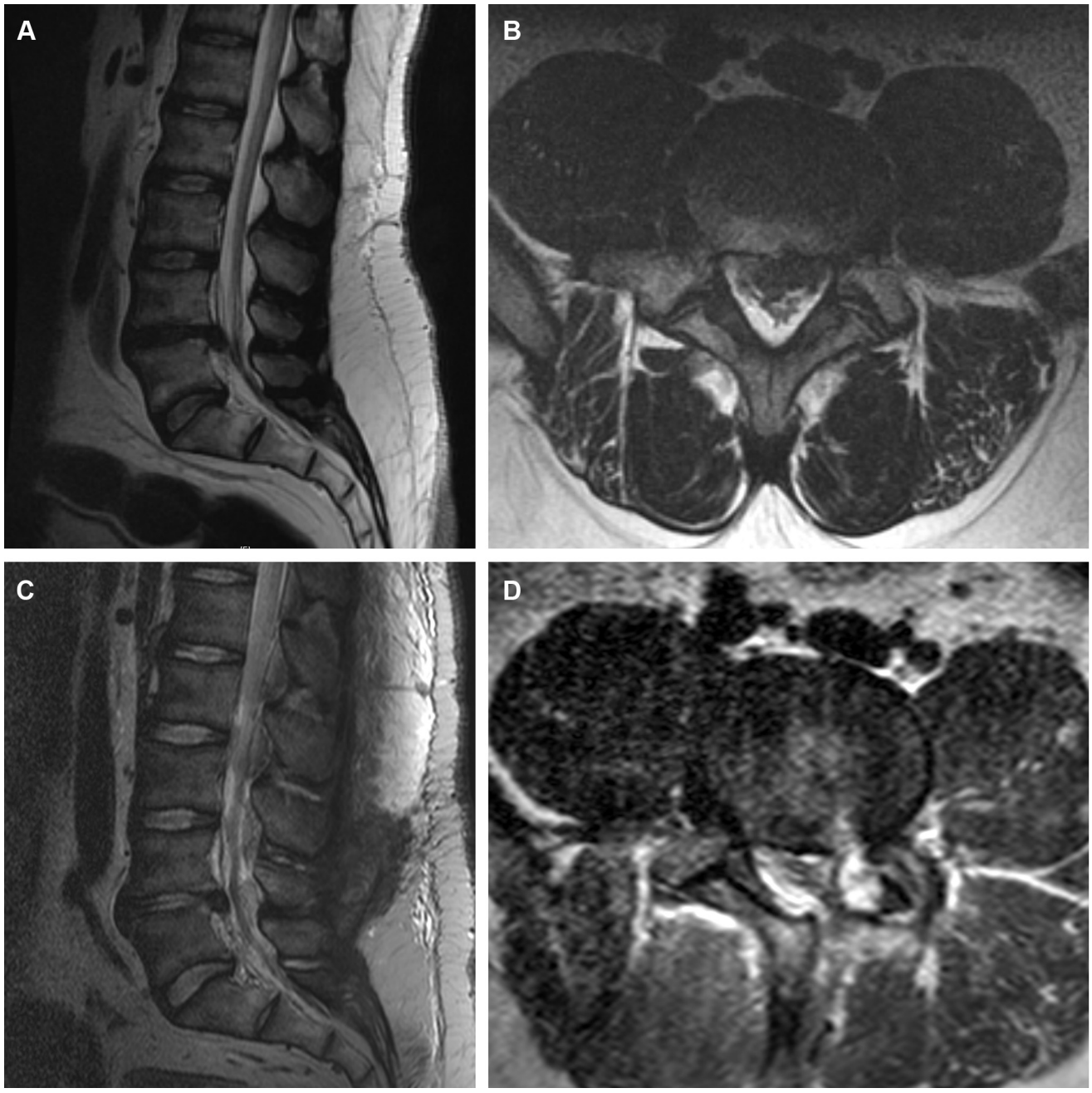

Figure 2. Preoperative sagittal (**A**) and axial (**B**) T2-weighted magnetic resonance imaging of the lumbar spine in a 42-year-old man who presented with symptoms of left leg pain, numbness, and mild dorsiflexion weakness showing a disc herniation at the L4-5 level. Following left L4-5 microdiscectomy, symptoms worsened prompting follow-up imaging. Sagittal (**C**) and axial (**D**) T2-weighted magnetic resonance imaging of the lumbar spine demonstrated foreshortening of the L4-5 disc space and persisting, albeit smaller disc protrusion.

described a syndrome of "numb, clumsy hands" associated with few symptoms in the lower extremities, and Voskuhl and Hinton[8] noted a glove distribution of sensory loss from spondylotic myelopathy. The prevalence of presenting symptoms in the upper extremities, especially the hands, has continued to be a reproducible feature of the clinical description of CM in large series of surgically treated patients.[1,4,9,10] Indeed, the sensory component of the modified Japanese Orthopaedic Association Score commonly used to assess

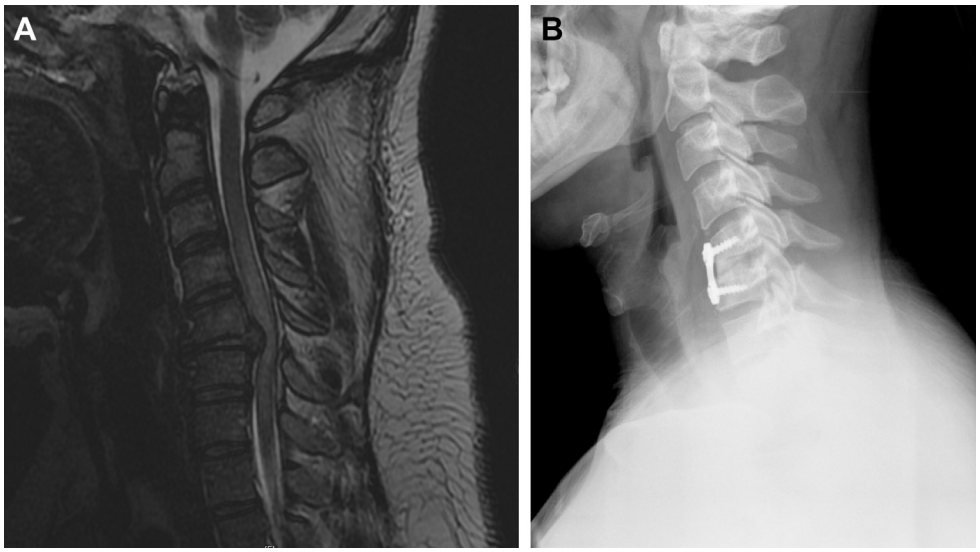

Figure 3. Sagittal T2-weighted magnetic resonance imaging (**A**) of the cervical spine of the same patient in Figure 2 demonstrating a large C5-6 disc herniation causing spinal cord compression and T2 cord signal change. Postoperative lateral x-ray (**B**) following anterior cervical discectomy and fusion.

the severity of CM addresses only upper extremity symptoms, and thus the score may not be the best measurement of patients with the atypical mode of presentation described in this report.[11] Whereas degenerative disc disease may produce symptoms of axial neck pain, spinal cord compression may not be associated with any pain, leading patients in some cases not to consider the cervical spine as the cause of neurologic symptoms of hand numbness and gait instability. Moreover, degenerative changes may also lead

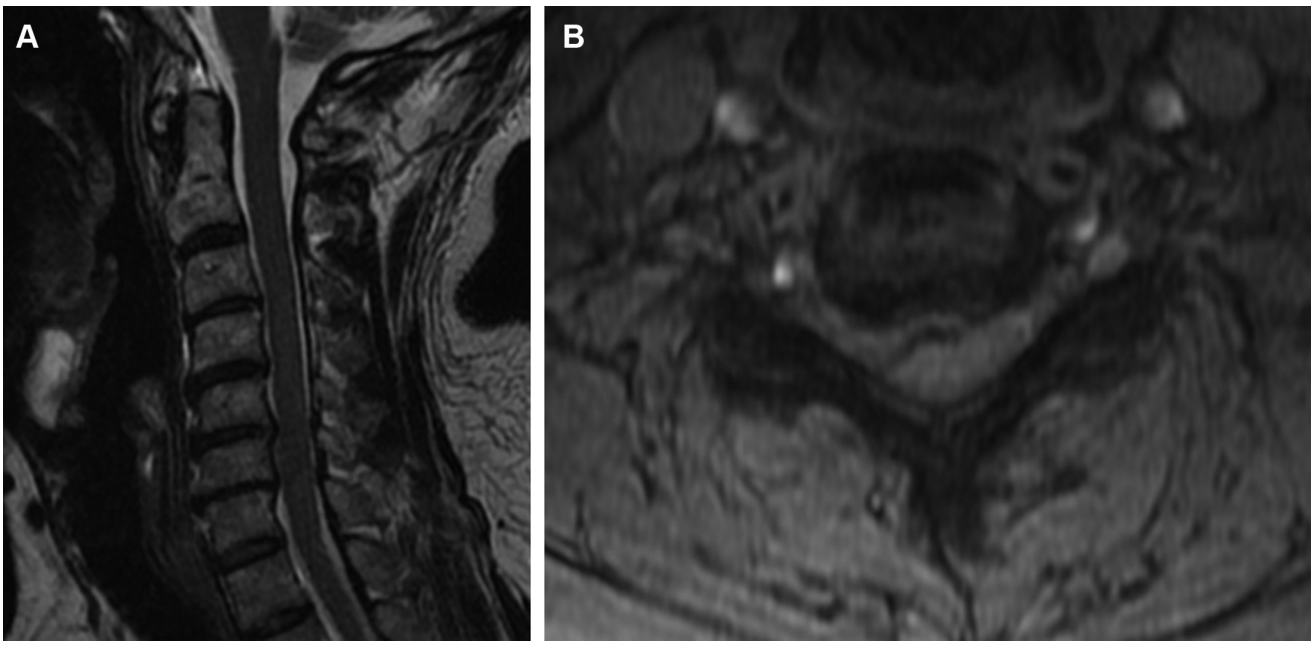

Figure 4. Preoperative sagittal (**A**) and axial (**B**) T2-weighted magnetic resonance imaging of the cervical spine in a 45-year-old man presenting with dragging of right foot but no upper extremity symptoms. Neurologic examination was normal in the upper extremities, but there was 4−5 right dorsiflexion weakness, upper thoracic sensory level, and a right Babinski sign. Magnetic resonance imaging demonstrated multilevel stenosis but focally significant cord compression at C5-6 from spondylosis with a superimposed disc herniation eccentric to the right.

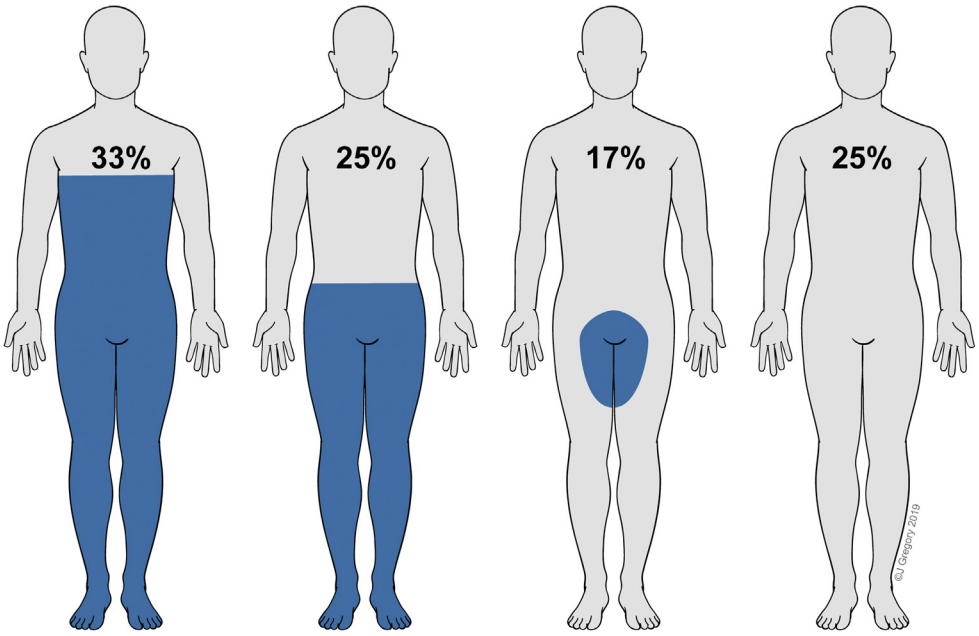

Figure 5. Illustration depicting the various patterns of perceived sensory loss reported by patients presenting with cervical myelopathy without symptoms in the upper extremities. Whereas a midthoracic pin level was seen most often in patients reporting numbness, some patients experienced numbness only from the waist level down or only in the genital region. One fourth of patients had no discernible numbness.

to compression of the exiting roots producing concurrent symptoms of arm pain from radiculopathy.[12]

In contrast to the typical presentation, this investigation illustrates that a small subset of patients with CM may fail to complain of upper extremity symptoms.[13-15] Rare reports in the literature have reported unusual presentations of cervical cord compression with pain or numbness evident only in the legs.[16-18] One of the most striking observations in these patients is the apparent lack of concordance of the perceived sensory loss and the level of spinal cord compression (**Figure 5**). This phenomenon was recognized very early in the history of spinal surgery, and an upper thoracic pin level with cervical pathology is described in the early works of Elsberg[19] as well as Mixter and Barr[20,21] In the limited literature that addresses this phenomenon, there is considerable variability in the sensory level that may be encountered with cervical cord compression, in some instances appearing as low as the thighs.[2,13,22] For example, Hellmann et al.[14] reported 10 patients in whom brain and cervical cord lesions produced numbness starting as low as the T10-T12 level.[14]

Patients in our series typically reported difficulty walking. Few clinicians would fail to consider cervical cord dysfunction when presented with coexisting symptoms of numb and clumsy hands; however, when these symptoms are absent, walking difficulty may be attributed to a lumbar problem in patients with symptoms of back and/or leg pain. Indeed, 10 of 12 (82%) of our patients had received some initial treatment for lumbar disease before CM was diagnosed. It is important to note that although no patient in our study group presented with any symptoms referable to the upper extremities, careful examination did demonstrate in some of these patients upper extremity findings suspicious for CM, including Hoffmann sign, Babinski sign, and hyperreflexia; this emphasizes the importance of a thorough and complete neurologic examination even when a patient presents to the clinician with lumbar MRI that shows abnormalities that one could reasonably expect to be a cause of difficulty walking.

Limitations of this study include the retrospective nature of the study design and the small number of the patients in the study group. In addition, data compiled with regard to presenting symptoms are limited by the accuracy and completeness of narrative descriptions of presenting symptoms.

CONCLUSIONS

CM from spondylosis, ossification of posterior longitudinal ligament, or disc herniation may rarely manifest without symptoms in the upper extremities, instead manifesting with numbness perceived as starting from well below the spinal level of compression, lower extremity weakness, and symptoms of gait difficulty. When present, numbness may be noted to start in the upper trunk, waist level, or genital area. The presence of low back pain and leg pain from coexisting lumbar disease may delay the diagnosis. All patients with this mode of presentation had cervical cord compression at either the C5-6 or the C6-7 level and accounted for approximately 1% of all patients undergoing cervical decompression surgery. Surgery resulted in neurologic improvement in all patients. Awareness of this atypical pattern of presentation may aid in clinical assessment of a subset of patients with cervical cord compression.

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Conflict of interest statement: The authors declare that the article content was composed in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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