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The Natural History of Cervical Spondylotic Myelopathy

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This is a retrospective study of twenty-two patients with cervical spondylotic myelopathy who were admitted to the hospital for surgical treatment of their neurological condition. The purpose of the study was to evaluate the presenting symptoms, factors affecting the diagnosis and the course of the disease prior to surgical intervention. The earliest consistent symptom in all of our patients was a gait abnormality. The course of the disease was one of progressive deterioration. Spontaneous regression did not occur in any of the cases. The vagueness of the initial complaints led to considerable delay in the diagnosis (average of 6.3 years). Magnetic Resonance Imaging (MRI) was the most useful test in confirming the diagnosis.

INTRODUCTION

As humans age, degenerative changes of the mobile and flexible parts of the spine are a natural consequence. The sequence of degenerative changes that constitute cervical spondylosis include intervertebral disc degeneration, disc space collapse, osteophyte formation, and hypertrophy of the ligamentum flavum, lamina and facets. These changes, when occurring in conjunction with a narrow canal, predispose the aging patient to cervical spondylotic myelopathy. Although the gait abnormality has been long recognized in the elderly, the clinical entity referred to as cervical spondylotic myelopathy was not described until 1952 when Brain, Northfield and Wilkinson [1] described a series of patients with myelopathic symptoms associated with cervical spondylosis.

Clarke and Robinson [2] (1956) published the first study that sheds some light on the natural history of cervical spondylotic myelopathy. They recognized that once the myelopathic component of the disease was present remission to normality did not occur. Also, they observed that motor changes were likely to persist and progress over time. Nevertheless, they concluded that the disease was episodic with rare episodes of acute deterioration. Lees and Turner [3] felt that cervical spondylotic myelopathy was a benign condition with a lengthy clinical course and long periods during which there was no disease progression. Symon and Lavender [4] (1967) and Phillips [5] (1973) took issue with the characterization of cervical spondylotic myelopathy as a relatively benign condition. They noted that there was significant disability with the condition and improvement was rare.

Our appreciation of the natural history of this disease entity is complicated by the fact that the myelopathic condition caused by spondylosis may be combined with cervical radiculopathy of similar degenerative etiology. Also, it is widely believed that the disease entity is diagnosed by excluding motor neuron disease such as amyotropic lateral sclerosis, as well as multiple sclerosis and certain spinal cord and brain lesions including

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[e]*Abbreviations used:* MRI, magnetic resonance imaging.

spinal tumors, low pressure hydrocephalus and cerebrovascular insufficiency [6, 7]. This indirect approach to diagnosis further hinders prompt recognition and treatment.

The purpose of this study was to evaluate the natural history of cervical spondylotic myelopathy. The focus of the study was to identify: 1) the early presenting symptoms; 2) the length of time between onset of symptoms and diagnosis, and 3) the course of the disease prior to surgical intervention.

MATERIALS AND METHODS

A retrospective review was done at Louisiana State University Medical Center-Shreveport of all patients with cervical lesions who underwent operative treatment of the orthopaedic spine service between June 1987 and June 1992. One hundred forty-five patients were identified with cervical conditions that required operative treatment. Of these patients, 34 had purely myelopathic symptoms. Of this group, 22 patients were available for detailed study of their presenting symptoms, activity level, progression of disease, and events leading to the diagnosis. The charts of all the patients were reviewed and additional information was obtained by telephone interview. Sixteen of the patients were available for postoperative evaluation.

Patient profile

The study included 17 males and 5 females. The mean age of patients in this study was 50.8 years (range 31–80 years). The peak age group was the fifth decade, with nine of the twenty-two patients being in this age range (Figure 1).

RESULTS

Symptoms at onset of disease

Multiple presentations for cervical spondylotic myelopathy have been reported in the literature. In our study, the earliest symptoms (100%) consisted of a feeling of clumsiness and a change in gait that the patient could not describe (Table 1). Gait is peculiar to the individual, and differences are seen in rhythm, speed, and balance in normal individuals. Further, subtle changes in gait are difficult to discern even when the gait is evaluated by a trained observer. It is no wonder that patients describe changes in their gait pattern as clumsiness and a feeling of uncertainty when ambulating. Other nonspecific complaints included weakness (45%) and alteration of daily activity (36%). Neck pain (36%) and shoulder pain (23%) were also noted. In one patient, a transient episode of bladder incontinence was noted.

Symptoms at the tme of preoperative evaluation

By the time the patient was admitted for operative treatment, the symptoms had progressed (Table 2) with worsening of the gait, and loss of dexterity of the upper limbs had become an important complaint (72%). Nonspecific weakness (54%) and sensory abnormalities (54%) of the upper and lower limbs were pronounced in a number of patients, but only 36% complained of neck pain. Also, episodes of blurred vision, tinnitus, and dysphagia were noted by the majority of patients. In addition, more patients had developed transient bladder incontinence (27%).

Elapsed time from onset of symptoms to diagnosis

The mean time between the onset of symptom and diagnosis was 6.3 years (Table 3). The patients had been seen by numerous physicians in the intervening period but the diagnosis was not entertained because the complaints were not specific enough for the evaluating physician to proceed with a careful neurological work up.

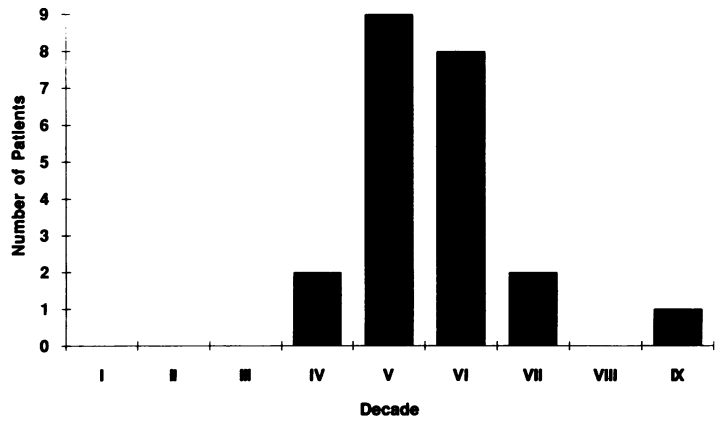

Figure 1. Age of patients.

Table 1. Symptoms at onset of disease (22 patients).

Clumsiness	22	100
Gait change	22	100
Weakness	10	45
Alteration of daily activity	8	36
Neck pain	8	36
Shoulder pain	5	23
Bladder incontinence	1	4

Progression of severity of cervical spondylotic myelopathy over time

Nurick [8] recognized the importance of the gait abnormality as the first clinical symptom that the patient recognizes and is likely to complain about to his physician. Hence, disability was classified according to the degree of gait abnormality that was present. The categories range from a grade of zero where the patient has no evidence of cord involvement to Grade V where patients are chair bound or bedridden (Table 4).

Using Nurick's classification, all our patients were Grade II when they first recognized an abnormality in their physical condition (Figure 2). By the time they were admitted for operative treatment, they had deteriorated with one patient progressing to Grade III, 17 patients deteriorating to Grade IV and four to Grade V (Figure 3).

Diagnostic evaluation

All 22 patients had extensive diagnostic imaging studies performed as part of the evaluation of their disease. Anteroposterior, lateral, and oblique radiographs showed varying degrees of disc space narrowing, osteophytes and other changes of spondylosis, but the changes noted did not enhance the diagnosis of the clinical entity. MRI[b] was noted to be the single most useful study in confirming the diagnosis. Until the MRI was obtained, the diagnosis was not strongly entertained in 19 of the 22 patients.

Surgical treatment

Twenty-one of the 22 patients underwent operative treatment. One patient was so debilitated from his disease that he expired the night before his scheduled operation.

Table 2. Symptoms during admission to the hospital for surgical treatment (22 patients).

Gait abnormality	22	100
Loss of dexterity of upper extremity	16	72
Non-specific weakness	12	54
Sensory abnormality	14	63
Neck pain	8	36
Bladder incontinence	6	27

Table 3. Elapsed time from onset of symptoms to diagnosis.

Time (years)	<1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	>10
# of points	2	1	1	1	5	0	7	2	1	2

Mean: 6.3 years

Twenty patients underwent anterior decompression (hemivertebrectomy) and fusion with either iliac crest or fibula. One patient underwent laminoplasty. Surgical approach, technique, and outcome will not be discussed in this article since the focus of the study was on the events noted prior to intervention.

Illustrative case

A 51 year-old woman had presented to her family physician at the age of 40 with complaints of constant dull aching shoulder pain. She had been diagnosed as having tension headaches and placed on a program of rest, heat, and nonsteroidal anti-inflammatory drugs. Approximately eight months later, the patient recognized a change in her gait. She felt "unbalanced" when walking. She went back to her family physician because of fear that she was losing her ability to walk. The gait abnormality was thought to be secondary to hypertension or hypoglycemia, although there was no clear evidence to support either diagnosis. Approximately one year after her gait symptoms started, she was referred to a neurologist because of persistent complaints. At that time her symptoms were thought to be psychosomatic, and she was placed on a program of stress reduction. Over the next year, lower limb function deteriorated and, by then, the patient was experiencing upper limb weakness. As her upper limb symptoms progressed, she was referred to an orthopaedic surgeon who diagnosed carpal tunnel syndrome and treated her with splints, anti-inflammatory agent,s and steroid injections. Over the next two years, her gait abnormality became pronounced, with an inability to walk even short distances without her legs giving way. She was evaluated once more and a diagnosis of "chronic neck pain" was made. The patient's condition continued to deteriorate to the point where she was unable to tie her shoes and could barely walk with a walker or cane. Almost nine years after the initial presentation of her gait symptoms, a second orthopaedic surgeon diagnosed cervical spondylotic myelopathy. An MRI showed stenosis of the cervical spinal canal at several levels with compression of the cervical spinal cord and exiting nerve roots. The patient underwent anterior decompression and fusion ten years after the onset of symptoms. She subsequently recovered considerable function, although she still used a cane to get around.

Table 4. Nurick's classification of disability in spondylotic myelopathy.

Grade 0	No evidence of cord involvement
Grade I	Signs of cord involvement
	Normal gait
Grade II	Mild gait involvement
	Able to be employed
Grade III	Gait abnormality prevents employment
Grade IV	Able to ambulate only with assistance
Grade V	Chair bound or bedridden

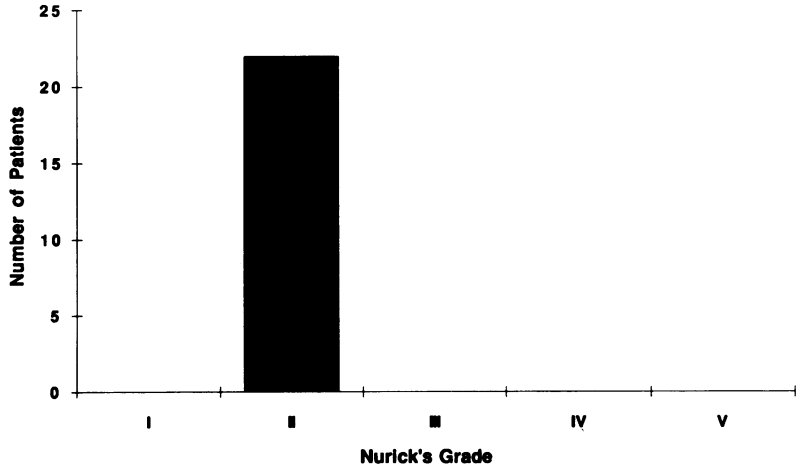

Figure 2. Nurick's grade at the time of onset of symptoms.

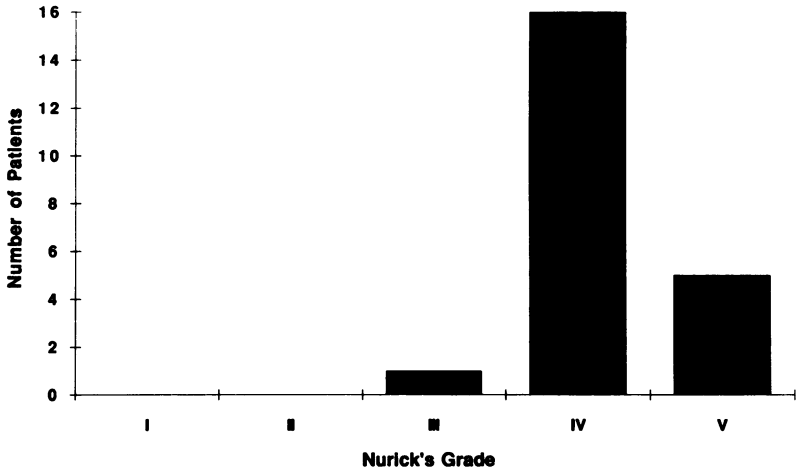

Figure 3. Nurick's grade at the time of pre-operative evaluation.

Case discussion

This case illustrates the diagnostic challenge to physicians by a condition that first presents with subtle deficits in gait and fine motor movement. The loss of dexterity and

unsteadiness were nonspecific and were not detected for several years. Even when weakness developed, the diagnosis was delayed because the upper limb symptoms mimicked carpal tunnel syndrome and the gait abnormality was vague and difficult to quantify. Therefore, it was not investigated vigorously. Progressive symptoms and persistent patient complaints eventually led to the correct diagnosis.

DISCUSSION

Cervical spondylotic myelopathy is due to degenerative changes that occur around the spinal cord. This includes the adjacent osseous and soft tissue structures which have varying contributions to the clinical problem. Ferguson and Caplan [9] described four clinical entities with different symptom complexes. Gait abnormality featured prominently in all the entities. Ono and associates [10] focused on the upper limb and described a characteristic dysfunction they called the "myelopathy hand," frequently present with lesions at C5-6 and above. Two abnormalities were noted and tests described for each. One finding was weakness of adduction and extension in the ulnar two or three digits, and the other abnormality was an inability to grip and release rapidly with the involved ulnar digits. These findings were useful in distinguishing between myelopathy and changes due to nerve root or peripheral nerve disorder. Although there have been many descriptions of the symptoms and signs of the disease, the natural history has not been fully characterized and considerable disagreement exists [11].

Since no single sign or symptom is unique to cervical spondylotic myelopathy, the diagnosis is entertained only when a constellation of signs and symptoms are present and persist. By the time the diagnosis is made, the condition of the patient is such that there is severe disability - an indication for surgical treatment. Therefore, a retrospective study of surgical patients represents a select population in whom the later effects of the disease are manifested. In the absence of a better way to define the condition, this represents the only window into the natural history of the disease and explains the absence of definitive studies on this subject. As for the potentially larger group of patients who have the disease but are awaiting diagnosis, there is as yet no way of predicting the course of their disease until the clinical entity is defined clearly. Until patients and treating physicians are aware that symptoms which are vague and intangible may be real and represent a serious ailment, the natural history will have to be obtained from those whose disease has progressed.

Our study concentrated on the symptoms and points to the subtle and abstract nature of the patient's complaints. Subtle gait disturbance with gradual deterioration was noted by all our patients but there was considerable delay in the recognition of this symptom as a serious spinal disorder. Although many authors [8, 11, 12] have recognized gait as an important early finding in cervical spondylotic myelopathy, the importance of closely following these patients, including periodic evaluation, has not been emphasized. In fact, the diagnosis in our cases was not made for many years (average time = 6.3 years) because the subtle but progressive gait deficit was not recognized as the early manifestation of serious spinal cord pathology.

Lees' and Turner's [3] view of the disease as one involving short periods of worsening followed by long intervals of relative stability was not born out in our patients. Almost all our patients deteriorated progressively with no stabilization of symptoms. The majority of our patients worsened by two grades using Nurick's [8] grading system.

The advantages and disadvantages of the various imaging studies used to study the degenerated spine has been described by Modic et al. [14]. While there may be merit in plain radiographs and water soluble myelograms with computerized tomography, the most useful test in our study was magnetic resonance imaging. Until the MRI was

obtained, the diagnosis of cervical spondylotic myelopathy was not strongly entertained. The magnetic resonance imaging study provided a noninvasive evaluation of the spinal cord, nerve roots and soft tissues. It also assisted in excluding intramedullary lesions of the central nervous system [14]

Cervical spondylotic myelopathy is the most common cervical cord disease in patients over 55. Also, it may be the single most underdiagnosed common spinal disorder [17] because of the vagueness of the symptoms and the belief that it is a diagnosis of exclusion. This would certainly argue in favor of obtaining an MRI in all patients over 40 whose complaint of gait abnormality is persistent and no other satisfactory anatomical explanation exists for the symptom. The information provided by an MRI study may compensate for the additional cost.

CONCLUSION

Cervical spondylotic myelopathy is a spinal cord dysfunction that first manifests itself as a subtle gait disturbance. The condition is often progressive with the symptoms worsening unabated. These findings are often viewed as secondary to a separate, co-existing problem, such as rheumatoid arthritis, hip disease, or simply to aging. Furthermore, most patients do not complain of neck pain and few have radicular symptoms. Therefore, vigorous investigation of complaints of gait abnormality and a high degree of suspicion of the clinical entity are essential for the prompt diagnosis of cervical spondylotic myelopathy. All patients over 40 with gait abnormalities should be investigated with an MRI study of the cervical spine as part of their workup when no other anatomic explanation exists.

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