The Natural History of Degenerative Cervical Myelopathy

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KEYWORDS

• Cervical spondylotic myelopathy • Degenerative cervical myelopathy • Natural history • Outcomes • Spine surgery • Spinal cord

KEY POINTS

- The natural history of degenerative cervical myelopathy (DCM) is mixed, but generally consists of stepwise neurologic decline, with variable periods of quiescence.
- The contemporary literature indicates 20% to 62% of patients with DCM will deteriorate at 3 to 6 years of follow-up, as assessed by the modified Japanese Orthopedic Association scale.
- Nonoperative treatment modalities for DCM include cervical traction, cervical collar, analgesics, physical therapy, bedrest, avoidance of risk activities and environments (eg, slippery floors), and spinal injections.
- Multiple studies have explored the prognostic value of several demographic, clinical, and radiological characteristics, but none appear to reliably predict the risk of neurologic deterioration associated with use of conservative strategies for the treatment of DCM.
- Further prospective studies evaluating the course of disease, particularly mild DCM, are needed.

INTRODUCTION

Degenerative cervical myelopathy (DCM) is a spinal condition that results in chronic, nontraumatic compression of the cervical spinal cord. It is the leading cause of spinal cord dysfunction among adults worldwide.[1] This clinicopathologic entity encompasses osteoarthritic degeneration (ie, cervical spondylosis) and ligamentous aberrations (ie, ossification of the posterior longitudinal ligament, hypertrophy of the ligamentum flavum). The issues of quality, value, and cost are moving to the forefront of health care policy making, and spine surgery is no exception. With increasing scrutiny, there is a need for us to provide evidence backing the value of the interventions we perform. The value of surgery for DCM, as with any intervention for any disease, is measured against the yardstick of the natural history of the condition; that is, the outcome that results in the absence of any intervention. In the case of DCM, this is equivalent to nonoperative management, or observation. Traditionally, DCM has been considered a progressive disease, with the role of surgery being to halt progression of neurologic dysfunction and further disability. More recent evidence indicates surgical intervention for DCM is actually associated with improvement in function and quality of life.[2,3] Nonetheless, more data are needed on the outcomes of nonoperative treatment of DCM for these data to be interpreted meaningfully. Serial clinical follow-up rather than surgery is sometimes recommended in cases of mild DCM, particularly if there is concomitant neck pain or radiculopathy, which

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are thought to possibly benefit from nonoperative treatment modalities like analgesics, physiotherapy, spinal injections, and/or orthoses. Herein, we provide a narrative review of the natural history of DCM. We summarize the neurologic, functional, and quality-of-life outcomes of nonoperative management, and also the predictors of said outcomes. We also examine the course of nonmyelopathic patients with radiological evidence of cervical spinal cord compression.

NATURAL HISTORY

Table 1 provides a summary of studies providing longitudinal data on the progression and outcome of DCM treated nonsurgically.

Neurologic Outcome

Cervical spondylosis was first clearly defined in 1948 by Brain and colleagues.[4] Early on, DCM was thought of as a disease causing a variable degree of disability, but one in which the natural tendency was toward a state of arrest or stability.[5] Lees and Turner[6] provided one of the first accounts of the natural history of DCM. This was a retrospective study of 44 patients with clinical evidence of myelopathy followed at St. Bartholomew's Hospital in London, England. The investigators observed and described the course of DCM to contain long or shorter periods of exacerbation, with interspersed long periods of quiescence, without new or worsening symptoms. Exacerbations often left patients worse than they were previously. Few patients deteriorated gradually over several years. At last follow-up, 2 patients (4.5%) had no disability, 3 (6.8%) mild disability, 21 (47.7%) moderate disability, and 18 (40.9%) severe disability. No relation between age and prognosis was found. Despite the seemingly poor outcomes, the investigators concluded that when it came to management of DCM, "a very conservative approach should be the rule," although they acknowledged the need for prospective studies.

The contemporary literature would suggest anywhere between 20% and 62% of patients with DCM will deteriorate neurologically within 3 to 6 months.[7] Fig. 1 provides a graph of rates of deterioration at varying lengths of follow-up with conservative treatment of DCM, as evaluated by the Japanese Orthopedic Association (JOA) or modified JOA (mJOA) scale or Nurick grade. Kadanka and colleagues[8–12] conducted the only randomized controlled trial (RCT) on the topic. From 1993 to 1998, 68 patients with mild or moderate DCM (mJOA score $\geq$12) were randomized to conservative or operative treatment. Surgery consisted of anterior decompression in 22 patients, corpectomy in 6 patients, and laminoplasty in 5 patients. Conservative strategies included cervical collar, anti-inflammatory medications, and intermittent bedrest for patients with pain, discouragement from participation in high-risk activities, and avoidance of risky environments (eg, physical overloading, movement on slippery surfaces, manipulation therapies, or prolonged flexion of the head). No significant difference was observed in mean mJOA score within or between the conservative and surgical cohorts over a 36-month period. At the 3-year mark, 24.1% of the surgical cohort had improved 2 or more points on the mJOA scale, not significantly different from the corresponding proportion in the conservative cohort (23.3%). At the 10-year mark, mean mJOA score was 15.0 in conservatively and 14.0 in surgically treated patients.

A cause for concern in patients with cervical spinal cord compression, whether symptomatic or not, is the development or exacerbation of myelopathic symptoms secondary to even minor trauma, especially mechanisms involving hyperextension of the neck. In a cohort of 199 patients with asymptomatic cervical spinal cord compression, Bednarik and colleagues[13] reported 14 patients suffered a traumatic event to the head, spine, trunk, or shoulder region over a median follow-up of 44 months. Of these patients, 1 (7.1%) developed myelopathy. By contrast, 44 (23.8%) of 185 patients who experienced no trauma developed myelopathy, suggesting the risk of myelopathy after minor trauma to be low. Nonetheless, another study seemed to suggest the opposite. Katoh and colleagues[14] retrospectively assessed the influence of trauma in a group of 118 patients with ossification of the posterior longitudinal ligament. Twenty-seven patients sustained minor trauma to the spine. Of 8 patients with preexisting myelopathy, 7 (87.5%) deteriorated neurologically. Of 19 patients who were previously asymptomatic, 13 (68.4%) developed myelopathy.

Functional Ability

The current literature suggests a progressive decline in patients' ability to participate in activities of daily living over time.[7]

In their RCT of conservative versus operative therapy for mild or moderate DCM, Kadanka and colleagues[8–12] evaluated patients' ability to perform activities of daily living (eg, buttoning shirts, brushing hair and teeth, putting shoes on, walking, running, going up and down stairs) by video recording. Blinded observers rated patients' functional abilities as follows: excellent (+3), very good (+2), slightly better (+1), no change (0),