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ORIGINAL ARTICLE

Presence of Undiagnosed Cervical Myelopathy in Patients referred for Surgical Evaluation of Lumbar Stenosis

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ABSTRACT

Introduction: Lumbar stenosis is a common clinical entity, i.e., being diagnosed with increasing frequency in our aging population in the United States. The process of spondylitic degeneration that causes lumbar stenosis may also give rise to concurrent cervical stenosis, resulting in so-called tandem stenosis. Symptomatic tandem spinal stenosis is characterized clinically by a combination of claudication and progressive gait disturbance with signs of mixed myelopathy and polyradiculopathy in both the upper and lower extremities.

Materials and methods: A retrospective review of 361 patients, referred to our clinic for evaluation of lumbar stenosis over a period of 4 years, was conducted. Data collection consisted of detailed chart review and tabulation of the duration of symptoms, course of nonsurgical therapy, sensory and motor deficits, gait/balance disturbances, upper motor neuron signs, and diagnostic imaging studies. Patients with signs and symptoms suggestive of cervical spondylitic myelopathy underwent confirmatory diagnostic imaging studies.

Results: Twenty-one of the 361 patients (5.8%) were found to have symptomatic tandem stenosis with clear clinical evidence of cervical myelopathy. Twelve of the 21 patients underwent cervical decompression; of these four underwent cervical decompression followed by lumbar decompression, and one patient underwent cervical decompression followed by thoracic decompression. Eight of the 21 patients underwent lumbar decompression only. One patient underwent lumbar decompression followed by cervical decompression.

Conclusion: The possibility of concurrent disease in both the cervical and lumbar spines reinforces the need for a thorough history and physical examination. Recognition and diagnosis of tandem stenosis is critical in determining the correct surgical sequencing and technique for treatment as spinal cord compression from cervical stenosis has significant associated morbidity and mortality. The 5.8% rate of tandem stenosis in this series places it in the lower end of the range from previous reports. Furthermore, only 3% of all patients referred for surgical evaluation of lumbar stenosis were ultimately found to have cervical stenosis requiring surgical decompression.

Keywords: Cervical myelopathy, Lumbar stenosis, Tandem stenosis.

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INTRODUCTION

Lumbar stenosis is a common clinical entity, i.e., being diagnosed with increasing frequency in our aging population in the United States. The process of spondylitic degeneration that causes lumbar stenosis may also give rise to concurrent cervical stenosis. Teng and Papatheodorou in 1964 first described the phenomenon of concurrent cervical and lumbar stenosis, coining the term "tandem stenosis."[1] Tandem stenosis has a reported prevalence ranging from 5 to 25%.[2,3] Patients with tandem stenosis often present with a confusing clinical picture of coexistent signs and symptoms of myelopathy and polyradiculopathy. At the beginning of the disease, symptoms and signs referable to one level will dominate the clinical picture and obscure the second level. But in later stages, findings referable to the second level may occur.[4] The triad consists of (1) Intermittent claudication, (2) progressive gait disturbance, and (3) mixed upper and lower extremities symptoms and signs.[2] Physical examination often reveals both upper and lower motor neuron signs. Typically, either cervical or lumbar complaints predominate, with the second level presenting itself only after initial surgical treatment addressing the first. Most often, the clinical scenario is a failure to improve after decompressive lumbar laminectomy, with delayed recognition of cervical myelopathy.[5]

In this study, we sought to determine the presence of undiagnosed cervical myelopathy in patients referred to our clinic for surgical evaluation of lumbar spinal stenosis. The recognition of tandem spinal stenosis is paramount to the effective treatment of the patient and

affects the sequencing, timing, and technique of surgical intervention.

MATERIALS AND METHODS

A retrospective review of all patients referred to our clinic with the diagnosis of lumbar spinal stenosis between September 1, 2002, and October 31, 2006, was conducted. Patients 18 years and older were included in this study. Data collection consisted of detailed chart review and tabulation of the duration of symptoms, course of nonsurgical therapy, sensory and motor deficits, gait/balance disturbances, upper motor neuron signs, and diagnostic imaging studies. Patients with signs and symptoms suggestive of cervical spondylitic myelopathy including spasticity, hyperreflexia, upper extremity weakness, clonus, Babinski sign, Hoffman's sign, gait disturbance, and bowel/bladder or sexual dysfunction underwent additional confirmatory diagnostic imaging studies at the time of chart review, as noted.

RESULTS

Over the period from September 1, 2002, to October 31, 2006, 361 patients were referred to our clinic with the presumptive diagnosis of lumbar stenosis. After a thorough history and physical examination, if signs or symptoms consistent with possible cervical myelopathy were identified, additional confirmatory diagnostic imaging studies were obtained.

The distribution of signs and symptoms in patients found to have tandem spinal stenosis are described in Table 1. Hyperreflexia was the most common sign identified on neurologic examination that aroused suspicion for possible concurrent cervical cord dysfunction. Similarly, a careful history would often elicit concurrent complaints of neck pain and upper extremity symptoms.

Twenty-one of the 361 patients (5.8%) were found to have symptomatic tandem spinal stenosis with clinical evidence of cervical myelopathy. Twelve of the 21 patients underwent cervical decompression, and 7 of these 12 underwent cervical decompression only, while the remaining 5 underwent cervical decompression followed by lumbar decompression. Eight of the 21 patients with tandem stenosis underwent lumbar decompression only. One patient underwent lumbar decompression followed by cervical decompression, when his condition failed to improve after initial decompressive lumbar procedure, and another patient underwent cervical decompression followed by thoracic decompression upon discovery of concurrent cervical, thoracic, and lumbar stenosis.

Our recommendation for surgery was based on the premise that the more symptomatic level be treated first if the degree of cervical stenosis allowed for safe prone positioning for those who underwent lumbar decompression first. In each case, if the patient experienced substantial improvement in their symptomatology and level of function, a through discussion was undertaken with the patient regarding the potential risks and benefits of a second decompressive procedure. In many instances where patients had improved significantly after their initial decompressive procedure, they elected to defer further surgery in favor of conservative management.

A case of a 78-year-old male is illustrated. He was referred for surgical evaluation of lumbar stenosis. The lumbar Magnetic resonance imaging (MRI) scan showed evidence of lumbar canal spondylosis and stenosis (Fig. 1). After a thorough history and physical examination raised concern for myelopathy, the patient subsequently underwent a cervical spine MRI (Fig. 2), which showed a significant stenosis. He underwent a cervical decompression initially followed by a lumbar decompression 6 months later. He showed improvement in his upper limb symptoms following the cervical surgery and improvement of his claudication symptoms after the lumbar surgery.

Table 1: Prevalence of symptoms and signs of all patients

Symptoms	*Percentage*	*Signs*	*Percentage*
Low back pain	90.5	Hyperreflexia	61.9
Lower extremity pain	85.7	Lower extremity hypesthesia	42.9
Neck pain	57.1	Lower extremity weakness	38.1
Upper extremity pain	52.4	Upper extremity hypesthesia	33.3
Claudication	42.9	Upper extremity weakness	23.8
Gait instability	38.1	Clonus	19.0
Bowel/bladder/ erectile dysfunction	19.0	Babinski Hoffman	19.0 19.0

Fig. 1: Sagittal T2 MRI of the lumbar spine of a 78-year-old male patient

Fig. 2: Sagittal T2 MRI demonstrating severe cervical spinal stenosis in a 78-old-male patient

DISCUSSION

Patients with tandem stenosis typically present with the triad of intermittent neurogenic claudication, gait disturbance, and combined upper and lower motor neuron signs.[2] The process of spondylitic degeneration that occurs in the lumbar spine also causes similar changes in the cervical spine. As the most mobile portions of the spine, these two regions are particularly susceptible to degeneration through a cascade of events, including facet and ligamentous hypertrophy, osteophyte formation, posterior disk bulging, and facet incompetence with acquired spondylolisthesis. The end process of this cascade can result in central canal, lateral recess, and foraminal stenosis leading to spinal cord and nerve root compression.[6-8]

Patients with classic lumbar stenosis typically present with decreased exercise tolerance, owing to fatigue of the lower extremities with ambulation. This fatigue is typically associated with pain, numbness, and weakness or heaviness of the lower extremities that progresses directly with distance. Most often, the patient's symptoms resolve with rest and siting down or bending forward, when the lumbar canal and foramen diameter is at its widest. Riding a stationary bicycle or resting on a shopping trolley does not elicit the symptoms. In contrast to classic vascular claudication, the symptoms often include the buttocks and posterior thighs.[9] Neurologic examination may be normal or may reveal wide-based gait, abnormal Romberg, muscle weakness, vibration deficits, and hypoactive or absent reflexes. Given the nature of the disease, signs may not be elicited on examination and, therefore, a careful history most often provides the diagnosis.

Patients with classic cervical spondylitic myelopathy typically present with complaints of neck and/or upper extremity pain, neck stiffness, paresthesia, weakness, clumsiness, disequilibrium, bladder dysfunction, and sexual dysfunction. Neurologic examination of these patients may reveal decreased range of cervical motion, sensory abnormalities (pain, temperature, vibration, proprioception), weakness, spasticity, hyperreflexia, positive Hoffman's sign and Babinski sign, gait disturbance, and positive Romberg's sign.[10,11] In more advanced cases, the clinician may observe wasting of the shoulder girdle and hands, and a highly spastic, unsteady gait.

While patients with tandem stenosis typically present with some of the classic symptoms of cervical spondylitic myelopathy, the predominant patient complaint of intermittent neurogenic claudication and the presence of lumbar stenosis can obscure the otherwise overt signs and symptoms of clinical myelopathy. Both syndromes are comparable in their insidious onset and duration of symptoms. Some have postulated that the complex gait disturbance characteristic of tandem stenosis may be attributed to a complex syndrome including: (1) A pseudotabetic proprioceptive disturbance that may be exacerbated by even minor degrees of additional sensory loss and age-related proprioceptive loss, (2) mild-to-moderate proximal lower extremity weakness, (3) assumption of an unbalanced stooped posture adopted to provide relief of back and lower extremity pain, and (4) compensatory hyperextension of the neck in order to gaze at the horizon.[2]

It is important to recognize that the differential diagnosis in a patient presenting with this constellation of signs and symptoms must include multiple sclerosis, amyotrophic lateral sclerosis, multifocal motor neuropathy, polyradiculitis or Guillain–Barre syndrome, shoulder amyotrophy, Lyme disease, syringomyelia, "double crush" syndrome, rheumatoid arthritis, post-polio syndrome, pernicious anemia, spinal cord tumors, and psychogenic disorders.[10] A thorough history and clinical presentation will help to determine what additional diagnostic tests are indicated to establish a diagnosis. This might include brain MRI, EMG, SSEP/MEP testing, cerebrospinal fluid analysis, and additional blood tests.

Our finding of a 5.8% incidence of symptomatic tandem spinal stenosis is within the lower end of the range previously published in the literature.[2,3] Clear clinical evidence based on correlation of the history, neurologic examination, and diagnostic imaging studies and procedures should determine the indications for surgical intervention. The frequency of abnormalities in the aging spine on imaging studies is relatively high. Imaging and diagnostic studies of the spine in asymptomatic patients have shown rates of abnormality as high as 37% for discography, 36% on computed tomography scans, and 19 to 28% on MRI scans.[12-15]

When a clinical and radiological evidence of tandem stenosis is present, the surgical decision-making process becomes difficult and dictates the consideration of several questions:[4] (1) Priority of the level to be decompressed cervical or lumbar, (2) should a one-staged decompression of both levels be performed, (3) interval between the interventions for the two levels if a staged procedure is considered, (4) which patients should be investigated for cervical stenosis when referred with lumbar stenosis, and (5) what age group of patients should have a vigilant investigation or observation.

The sequencing of surgery in cases of tandem stenosis is not well established in the literature. There exist case reports and small case series of simultaneous cervical and lumbar decompressive procedures.[2,4] Dagi et al were the first to report the simultaneous decompression of the cervical and lumbar spines in cases of tandem stenosis. Their group determined the sequencing of surgery based on the level that was most clinically symptomatic or if both areas appeared equally symptomatic based on the degree of stenosis by myelography. In instances of equivalent severity of symptoms and degree of stenosis, simultaneous decompressive procedures were performed. The authors also report being influenced by the general medical condition of the patient and postulate that simultaneous procedures by two surgical teams minimizes the anesthetic risk to the patient. No analysis was performed to determine whether the outcomes were appreciably different in this subset of patients compared to patients who underwent sequential decompression on two separate occasions. Naderi and Mertol utilize a similar rationale in their case report detailing two cases of simultaneous cervical and lumbar decompression for tandem stenosis.[4] The concept of bilateral hip or knee arthroplasty under a single general anesthesia has become a reasonable indication with advanced care and general anesthetic techniques in this decade.[16-18] Bilateral arthroplasty may minimize hospital stay, reduce costs, and maximize patient function, as well as have an acceptable complication rate and surgical intervention.[17,18] It is likely that tandem stenosis has a similar obstinacy as the double crush syndrome.[16] Considering this model, a combined cervical and lumbar decompression is a valid concept. Surgical intervention was low when evaluated by operation time, total blood loss, and perioperative complications, suggesting that combined cervical and lumbar decompression may be indicated for elderly patients, because of its potential benefits of minimum hospital stay and reduced costs. Patient satisfaction score was high in 72% of patients.[16]

Our practice was consistent with most published reports where the cervical spine is decompressed first in cases of tandem stenosis with coexistent cervical and lumbar symptomatology. In cases with a clear predominance of signs and symptoms attributable to lumbar stenosis with only relatively mild-to-moderate cervical stenosis, the more symptomatic lumbar spine was decompressed first. In many instances, cervical decompression may result in the improvement of symptoms sometimes attributed to lumbar stenosis. This is because the lumbar neural fibers may also be under compression in the cervical spondylitic processes.[4] It is important to remember that the potential morbidity and mortality related to ongoing spinal cord compression as occurs with cervical stenosis exceeds that of lumbar stenosis. Finally, the initial cervical decompression greatly reduces the risk of neurologic injury that may occur during intubation and positioning for lumbar surgery. Although not statistically determined, most physicians would choose decompression for one lesion in accordance with each patient's clinical symptoms.[19,20] Sufficient data is not available on results of one-staged decompression.[16] There is no data available regarding the timing of second surgery, and this will depend entirely on the clinical deterioration or urgency of the second level. Radiographic signs of degenerative, spondylitic changes are seen in 50% of the population over the age of 50 years and in 75% of the population over the age of 64 years.[21,22] The fact that the prevalence of radiologic spinal stenosis is higher than the prevalence of symptomatic spinal stenosis dictates that the surgeon decide about the indication of surgery in patients with an accompanying radiologic stenosis without clinical signs.[4] Hence, patients after the age of 65 with evidence of mild-to-moderate cervical myelopathy must be radiologically investigated and depending on the clinical symptoms should be kept under observation.

CONCLUSION

The possibility of concurrent disease in both the cervical and lumbar spines reinforces the need for a thorough history and physical examination. Recognition and diagnosis of tandem stenosis is critical in determining the correct surgical sequencing and technique for treatment as spinal cord compression from cervical stenosis has significant associated morbidity and mortality. The 5.8% rate of tandem stenosis in this series places it in the lower end of the range from previous reports. Furthermore, only 3% of all patients referred for surgical evaluation of lumbar stenosis were ultimately found to have cervical stenosis requiring surgical decompression.

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