Nontraumatic Cervical Disc Herniation in a 21-Year-Old Patient With No Other Underlying Disease

—Case Report—

Hiroyuki IKEDA,1 Junya HANAKITA,1 Toshiyuki TAKAHASHI,1 Keita KURAISHI,1 and Mizuki WATANABE1

1Spinal Disorders Center, Fujieda Heisei Memorial Hospital, Fujieda, Shizuoka

Abstract

A 21-year-old woman presented with cervical myelopathy due to nontraumatic cervical disc herniation associated with cervical canal stenosis. The patient underwent removal of the herniated disc and anterior fusion with an autogenous iliac crest bone graft. After surgery, the patient showed satisfactory improvement. Cases of cervical disc herniation in our center and reported cases without cervical trauma in either young adults or in childhood were reviewed retrospectively. We discuss the pathogenesis of cervical disc herniation in our young patient in the context of these other cases. Cervical disc herniation rarely occurs before the age of 30 years. A history of cervical trauma and preexisting fusion of the cervical spine are risk factors for cervical disc herniation. The present case is the youngest known of nontraumatic disc herniation without other underlying disease. Hypermobility due to neck cracking and a relatively narrow spinal canal might have been important in causing cervical myelopathy by disc herniation.

Key words: cervical disc herniation, cervical myelopathy, disc degeneration, trauma, young

Introduction

Cervical disc herniation is seen most commonly in patients over 40 years old, and rarely occurs before the age of 30 years.28) Although lumbar disc herniation develops infrequently in teenagers,13,14) the onset age of cervical disc herniation is comparatively higher. We present a case of nontraumatic cervical disc herniation in a 21-year-old woman, and discuss the pathogenesis of cervical disc herniation in the young.

Case Report

A 21-year 11-month-old woman presented with slowly progressive numbness in her left thumb, index, and long fingers. At 6 months after onset, she had numbness in her right fingers and bilaterally below the knees to the tips of her toes. After the diagnosis of cervical disc herniation, she was referred to our center at the age of 22 years and 10 months. She had no history of trauma in the neck or head, but the patient had a habit of neck cracking for about 10 years. She had no remarkable medical or family history. Physical examination revealed numbness and reduced sensation on the four extremities, resulting in clumsy hands and difficulty with walking and standing. Deep tendon reflexes were +2 and symmetrical at the bilateral patellar and Achilles tendons. The Hoffman test was positive bilaterally and the Jackson test was positive. Laboratory findings were within normal limits.

Lateral radiography of the cervical spine in the neutral position showed a narrow spinal canal with 11-mm, 12-mm, and 12-mm anteroposterior diameters at the C3, C4, and C5 levels, respectively, and local kyphosis at the C2–C4 vertebral bodies. Flexion and extension radiography showed dynamic translation instability at the C3-4 intervertebral level (Fig. 1). Sagittal T2-weighted magnetic resonance imaging demonstrated herniation of the intervertebral disc at the C3-4 level, compressing the spinal cord, and a high intensity area in the cord. Axial T2-weighted magnetic resonance imaging of the C3-4 intervertebral level revealed spinal cord compression due to the herniated disc, with a high intensity area in the left side of the cord (Fig. 2). Reconstruction images of computed tomography after myelography showed the spinal cord compressed by the non-calciﬁed disc at the C3-4 level (Fig. 3).

Because of progressive neurological deterioration, she underwent a surgical procedure consisting of removal of the C3-4 herniated disc and anterior fusion with an autogenous iliac crest bone graft at the age of 23 years and 0 months. Intraoperatively, the intervertebral disc exhibited degenerative change and was compressing the dural sac...
posteriorly through a small tear in the posterior longitudinal ligament. Postoperatively, recovery was nearly complete, with only slight numbness remaining in the fingers of her left hand.

**Discussion**

Examination of the histological characteristics of herniated surgical discs revealed that all cervical herniated masses contained fragments of the cartilaginous endplate. Because intervertebral discs containing fragments of the cartilaginous endplate prolapse at the final phase of the disc degenerative process, the pathogenesis of cervical disc herniation can be attributed to degenerative changes of the cervical disc. Although cervical disc degenerative change with aging seems to begin from the teens, Luschka’s joints reduce the axial load to the intervertebral disc. Therefore, slight axial load cannot result in cervical disc herniation in patients with little degenerative disc change, which often occurs with lumbar disc herniation.

A total of 134 patients, 94 males and 40 females, with cervical disc herniation underwent surgical procedures at our center between January 2005 and December 2010 (Fig. 4). The mean age at surgery was 54.7 years (range 23–84 years). The peak age range for cervical disc herniation was 50–59 years, and none of our patients was under 20 years old. Two patients were in their twenties, a 21-year-old woman at the onset of symptoms, who was the youngest case in our center, and a 27-year-old man injured while snowboarding.
A history of cervical trauma and preexisting fusion of the cervical spine may be risk factors for cervical disc herniation. Thirty-four of our 134 cases (25.5%) were associated with cervical trauma. Among our patients under 40 years old, 6 of 14 (42.7%) had suffered from cervical trauma. Moreover, among our patients under 35 years old, 3 of 4 had suffered from cervical trauma, with the exception of the 21-year-old woman discussed above. Therefore, cervical disc herniation in younger patients was more likely to be associated with cervical trauma. The relatively severe overload caused by trauma can lead to disc herniation in the cervical spine, even if the cervical disc shows little degenerative change in the young. Furthermore, 17 of 134 cases (12.7%) were associated with either sports or work resulting in cervical repetitive overload and hypermobility without apparent trauma.

Preexisting cervical fusion may be involved, as 5 of 134 cases (3.73%) had cervical disc herniations at the segment adjacent to the site of previous arthrodesis of the cervical spine. Among these adjacent-segment diseases, the mean interval between the first cervical arthrodesis and the second surgical procedure was 10.0 years (range 4–15 years).

Spinal cord compression due to a prolapsed cervical disc without cervical trauma is very rare in either a young adult or during childhood. A 20-year-old man with Tourette’s syndrome had cervical myelopathy caused by cervical disc herniation. Repetitive involuntary cervical movements, such as tics, may have contributed to the development of cervical disc degeneration.

Degeneration of the intervertebral discs adjacent to the fusion segment is widely believed to be accelerated by the fusion procedure. More than one-fourth of all patients present with symptomatic adjacent-segment disease within 10 years after an anterior cervical arthrodesis. A 5-year-old girl with Klippel-Feil syndrome suffered symptomatic cervical cord compression secondary to a prolapsed disc at the non-fused segment adjacent to the congenital fusion. Hypermobility of the cervical spine at the adjacent non-fused segments in Klippel-Feil syndrome would lead to excessive stress and the development of cervical disc degeneration. Thus, the presence of either congenital or acquired cervical fusion may lead to the development of adjacent disc degeneration in the young. A 24-year-old man with congenital insensitivity to pain developed a herniated cervical disc at the C6-7 intervertebral level. The pathogenesis for the herniated disc was not discussed. The patient had previously undergone spinal arthrodesis at the T2–L2 levels for progressive thoracic scoliosis. Therefore, extensive thoracolumbar fusion may lead to excessive compensatory motion of the cervical spine, thus promoting degenerative changes at that level. In a retrospective observational longitudinal cohort analysis of 12,338 patients with degenerative cervical spine disease, significantly younger patients, under 49 years of age, had higher reoperation rates. Therefore, younger patients might have more overall cervical motion and therefore be at greater risk for adjacent-segment disease.

Congenital cervical canal stenosis is another factor related to cervical myelopathy in young patients that may be important. A 29-year-old man presented with severe spinal cord compression due to disc herniation accompanied by spinal canal stenosis. The relationship between the spinal canal diameter and the pathological changes was investigated using kinetic magnetic resonance imaging, and suggested that a narrow cervical spinal canal may result in segmental hypermobility and may greatly contribute to development of pathological changes in cervical intervertebral discs. Thus, patients with a narrow canal may be more susceptible to spinal cord compression.

A 21-year-old woman with rheumatoid arthritis developed a herniated cervical disc. Rheumatoid arthritis is characterized by persistent inflammatory synovitis at the cervical spine resulting in cartilage destruction and bony erosions. Immunohistochemically, the presence of inflammatory cell reaction products within and around herniated discs has been described, particularly the inflammatory cytokines, such as interleukin-1 and tumor necrosis factor-alpha.

Among other pathological conditions, intervertebral disc calcification is recognized as an uncommon affliction during childhood. Since the first case was reported in 1924, approximately 400 cases have been reported in the age range of 0–20 years. The etiology remains unclear, though various hypotheses, such as inflammatory mechanisms and trauma, have been proposed.

Aging is associated with decreases in cervical range of motion of approximately 5° per decade. Cervical disc degenerative change with aging is also associated with the reduced cervical range of motion. Cervical disc degeneration, caused by the loss of both proteoglycan and water in the disc, generally consists of the following 3 clinical stages: dysfunction, unstable phase, and stabilization with progression of the degenerative changes. Any abnormal loading condition including overload or immobilization can also lead to disc degeneration. We assume that cervical spinal disease in younger patients is more likely to be associated with hypermobility such as overload and trauma in the early stages of disc degeneration. However, the mechanisms underlying cervical spine disease in older patients might be tissue weakening in later stages of degeneration due to hypomobility, resulting in reduced stimulation of metabolic activity of disc cells or altered transport of nutrients and metabolites.

Our present patient had no obvious family history, inflammatory disorder, or cervical trauma. The segmental range of motion was assessed from the dynamic flexion and extension lateral radiographs. The segmental range of motion at the C2-3 level above the disc herniation, C3-4 level at the herniation, and C4-5 level below the herniation were 18°, 24°, and 25°, respectively (Fig. 1). Compared with the average segmental range of motion of 7° to 14° in a healthy study population, the cervical spine of our 21-year-old patient displayed severe instability, which may be associated with the higher rate of degeneration. She also had a habit of cracking her neck, so we hypothesized that the neck cracking may be associated with the cervical disc degeneration. No previous reports have described cases of cervical disc herniation caused by neck cracking. However, repetitive hypermobility due to neck cracking over a prolonged period might lead to the development of...
cervical disc degeneration similar to the previously reported case of cervical disc degeneration in a patient with Tourette’s syndrome. Furthermore, associated canal stenosis might facilitate cervical myelopathy due to cervical disc herniation earlier than usual.

The present case of cervical disc herniation occurred in the youngest known patient with neither cervical trauma nor other underlying disease. The patient’s neck cracking habit seemed to be important in the cervical myelopathy due to disc herniation.

**References**


**Neurol Med Chir (Tokyo)** 52, September, 2012


Address reprint requests to: Hiroyuki Ikeda, MD, Department of Neurosurgery, Kobe City Medical Center General Hospital, 2-1-1 Minatozimaminami-machi, Chuo-ku, Kobe, Hyogo 650-0047, Japan.
e-mail: rocky@kuhp.kyoto-u.ac.jp