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Case Report

An unusual case of pediatric cervical myelopathy due to congenital spinal canal stenosis

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A R T I C L E I N F O

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ABSTRACT

Cervical myelopathy is a condition that is rarely reported in pediatric patients who have movement or neuromuscular disorders. We, herein, present a rare case of cervical myelopathy observed in a 14-year-old patient, who was previously a healthy boy treated with cervical laminoplasty, which was caused by cervical spinal canal stenosis based on multiple level disc herniation. The patient presented to the clinic with spastic and ataxic gait with previous diagnostic challenges. Magnetic resonance imaging showed cervical degenerative changes mainly marked at the C3–C4 and C4–C5 levels, along with canal narrowing and a central high signal cord abnormality on T2-weighted images. A C3–C4 open-door laminoplasty surgery technique was performed. The neurological symptoms and signs improved dramatically following surgery. Subsequently, cervical computed tomography and magnetic resonance imaging showed good decompression of the cervical spinal cord during the 5 years of follow-up with the preservation of the range of movement. We concluded that though it is pretty rare, cervical myelopathy should be considered in diagnosing adolescent patients with gait and balance disorders.

Introduction

Cervical myelopathy is quite rare during childhood and adolescence, and it is normally seen in the adult population. In adolescents, cervical myelopathy without any underlying disease is quite rare. Surgery is rarely recommended for cervical myelopathy because herniated discs can spontaneously be absorbed in the juvenile group due to the natural course of the blood supply.[1] The small diameter of the spinal canal and recurring compressive trauma could act as static and dynamic factors, respectively, while cord ischemia developing as a result of the vascular factor of hypoperfusion could result in cervical cord pathology and finally cervical myelopathy.[2]

Our aim was to report a very rare case of a 14-year-old adolescent boy diagnosed 6 months after the start of the symptoms with cervical myelopathy who was successfully treated with spinal cord decompression using the open-door laminoplasty technique.

Case Presentation

A 14-year-old male patient had numbness in his left upper extremity for 6 months. He presented to our clinic with a progressive neurological deficit resulting in spastic and ataxic gait. There was no history of infection, tics, or trauma. He was going to middle school and spending at least 8 hours in a sitting position with a flexed neck at school. The major symptom at onset was left upper extremity sensory disturbance in the left arm. His neurological examination revealed features of cervical myelopathy with decreased leg strength, bilateral wasting of the hand muscles, spasticity, diffuse hyperreflexia, and bilateral Babinski and Hoffmann signs. The symptoms had become worse during the last 6 months of follow-up without any known diagnosis. Biochemical and hematologic test results were normal. Magnetic resonance imaging (MRI) showed cervical degenerative changes that were most marked at the C3–C4 level, along with canal narrowing and a central cord abnormality with a high T2 signal (Figure 1A–C).

A C3–C4 open-door laminoplasty surgery was performed, resulting in a dramatic improvement of neurological symptoms and signs. The neurological deficit recovered almost completely, and cervical computed tomography also showed good decompression of the cervical spinal cord with open-door laminoplasty using the mini-plaque technique at the C3 and C4 lamina levels (Figure 2A and B). The patient is currently symptom-free during the 5 years of follow-up with decompression of the spinal cord and decreased signal intensity at the previous high-intensity level (before the surgery) on sagittal MRI (Figure 3). The patient also did not have adjacent-level disc disease. In the 5-year long-term follow-up of our patient, there was no problem in terms of improvement of neurological functions and the preservation of cervical lordosis as well as the range of motion (Figure 4). Informed consent was obtained from the patient's family.

Discussion

In this study, we wished to discuss the late diagnosis of cervical myelopathy in an adolescent patient with almost full recovery after surgery with 5 years

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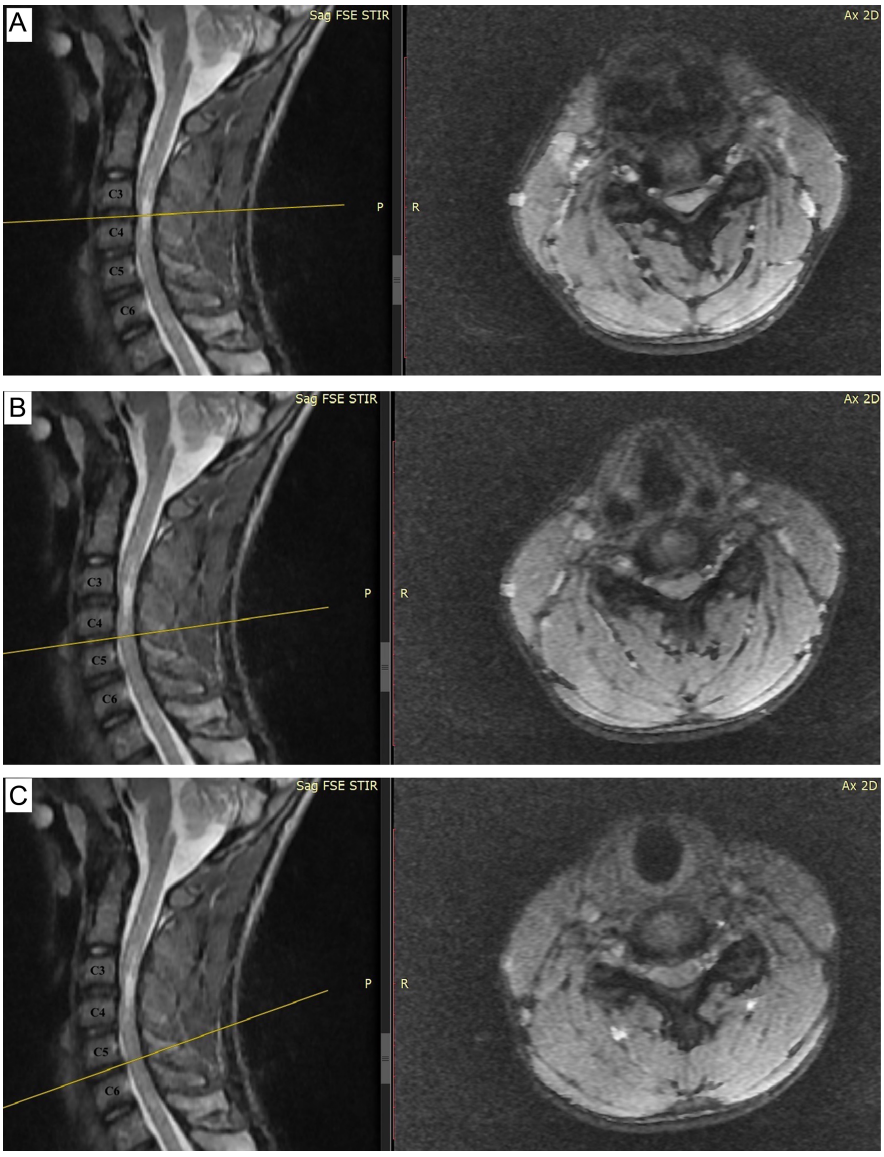

Figure 1. (A–C) A 14-year-old man presented with paresthesia and weakness in all 4 limbs. Preoperative sagittal magnetic resonance imaging indicated cervical degenerative changes that were most marked at the C3 and C4 levels together with canal narrowing and a central high signal cord abnormality on the T2-weighted image at the C3–C4 disc level.

of follow-up. In our particular case, the diagnosis could be made 6 months after the start of the symptoms. Cervical myelopathy should be considered in the differential diagnosis of previously healthy adolescent patients with progressive, primary central neurological deficits.

Previously, cases of cervical spondylopathy in pediatric and adolescent patients were reported with Hallervorden–Spatz disease, Tourette syndrome, Larsen's syndrome, and hypoventilation syndrome. Remondino et al[3] reported the surgical indication of cervical spondylosis in mucopolysaccharidosis patients. Mukai et al[4] described lower cervical spinal cord atrophy and anterior shift of the posterior surface of the cervical dura mater during neck flexion on myelography in 2 patients with Hirayama's disease. Kikuchi et al[5] named Hirayama's disease "flexion myelopathy." The same condition was also reported to occur in the thoracic spine, called "thoracic flexion myelopathy."[6] Flexion myelopathy in the cervical portion of the spine is called "cervical flexion myelopathy."[7]

HIGHLIGHTS

- Cervical myelopathy is rarely reported in pediatric patients with movement or neuromuscular disorders. This report describes a 14-year-old patient with cervical myelopathy who was previously a healthy boy treated with cervical laminoplasty.
- Cervical myelopathy should be considered in the differential diagnosis of previously healthy adolescent patients with walking difficulty and increased deep tendon reflexes.
- This report indicates that cervical spinal cord decompression with cervical laminoplasty may be the ideal treatment for pediatric group patients.

Both static (leading to stenosis) and dynamic (resulting in repetitive cord injury) forces are thought to play a role in cervical myelopathy pathophysiology. Minor trauma can result in severe neurological injuries such as central cord syndrome or quadriplegia without any fracture or dislocation in cervical spondylotic myelopathy patients.[8] Those risks are increased in patients with congenital canal stenosis.[9] The pathology often develops in individuals with a congenitally narrow spinal canal, supporting the role of static forces as in our

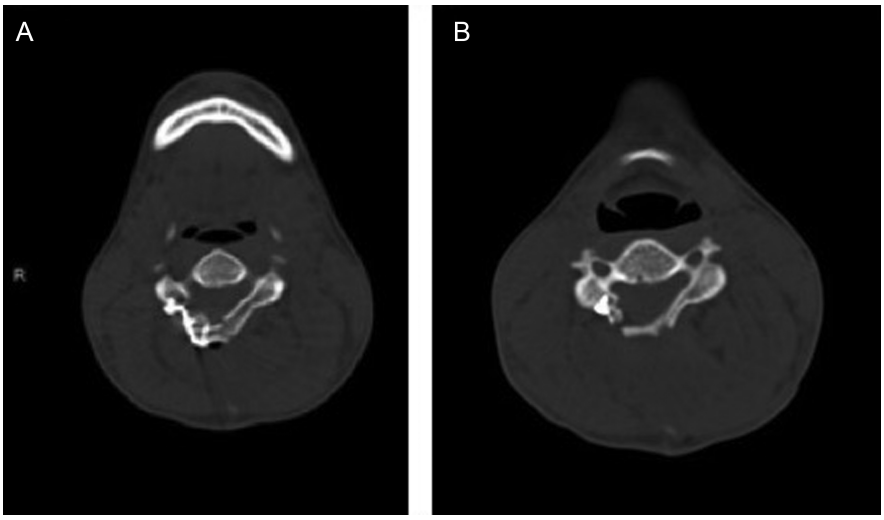

Figure 2. Postoperative axial computed tomography images at C3 (A) and C4 lamina levels (B) also demonstrated the open door laminoplasty technique with mini-plaque technique and decompression of the cervical spinal cord.

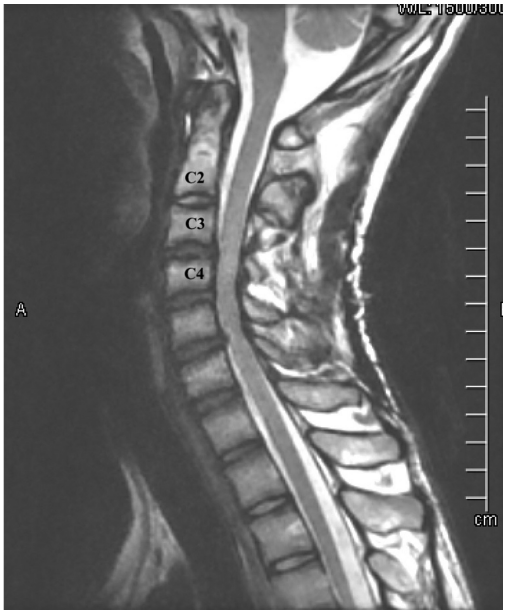

Figure 3. Postoperative sagittal magnetic resonance imaging 2 years after the operation.

patient.[10] The assessment of minor trauma cases in pediatric patients is not always simple or straightforward. It is also widely observed that infants and kids almost regularly undergo minor traumas during their routine daily lives. Patients diagnosed with central canal stenosis always have a greater risk of having a spinal cord injury; however, the prediagnosis of the narrow canal is not as evident without conducting a proper radiological examination. The application of direct compressive dynamic forces after repetitive hyperflexion and hyperextension may also lead to cord damage in these types of patients. It is thought that the presence of a minor injury can have a role in the development of acute myelopathy, which can potentially lead to compression of the anterior spinal artery damage. In our patient, the trauma history was not clear, and he was not involved in any professional sports. Other factors could be repetitive cord stretching and compression, together with venous congestion causing ischemia/hypoxia.[11] Repetitive neck movements with minor trauma can cause spondylosis.[12] Wada et al[13] reported that rabbits exposed to repetitive forceful neck extension and flexion showed early osteophyte development.

The anatomical and biomechanical characteristics of the cervical spine differ between children and adults, making differential diagnosis difficult in children.[14] Such difficulty leads to a late diagnosis,

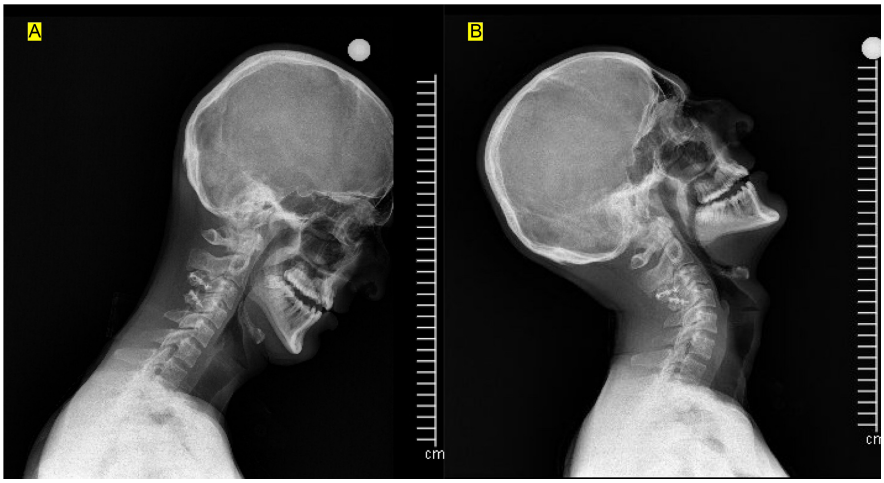

Figure 4. Postoperative hyperflexion (A) and hyperextension (B) radiographs 4 years after the operation showing a preserved range of motion of the cervical spine.

which may cause poorly recovered spinal cord compression symptoms even after good surgical decompression. Detailed neurological examination is important to obtain an accurate diagnosis related to walking difficulty. Early surgery can improve or prevent a neurological decline in these patients.

Cervical disc disease in adolescent patients is typically a benign process, and the symptoms mostly resolve spontaneously.[15] Surgical decompression should be performed when there is no recovery with conservative treatment or if there is neurological deterioration. Anterior cervical discectomy and fusion are reported to be safe procedures in children with good clinical results.[16] Hilibrand et al[17] reported that 25%-89% of patients who underwent anterior cervical arthrodesis and who were followed for a long period had degenerative changes at adjacent levels.[17] Surgeons should consider that the cervical spine will continue to grow in adolescent patients and that adjacent-level disease risk is higher in patients who are aged less than 30.[18] Cervical arthroplasty, which could preserve motion in the adolescent group, is not an option in patients with both cervical spinal canal stenosis and multiple disc herniations. Cervical laminoplasty is a good surgical option in patients with multilevel cervical spinal stenosis.[19] Additionally, it has been shown to be an effective method of treatment in older adolescents.[19] Sato et al[20] reported that laminoplasty for calcified intervertebral disc herniation at the cervicothoracic junction had an excellent outcome in a 13-year-old female patient with 5 years of follow-up.[20] The cervical laminoplasty technique, which preserves the posterior elements, might enhance spinal stability and may prevent kyphosis compared to cervical laminectomy.[19,20] Zhou et al[19] reported 3 late adolescent patients with disc herniation, cervical spinal stenosis, and myelopathy who were operated on successfully with the unilateral open-door laminoplasty technique. High signal intensity in the cervical spine disappeared in these patients over time. These patients had a favorable range of motion with resolved cervical discs without any cervical kyphotic deformity during follow-up. Su et al[21] showed that the recovery of neurological functions is important and that cervical lordosis is well preserved in the long-term follow-up of 49 patients who underwent open-door laminoplasty. In another study, Chiba et al[22] reported that the open-door laminoplasty technique in the treatment of cervical myelopathy has very favorable long-term treatment results in terms of Japanese Orthopaedic Association (JOA) score, radiological alignment, cervical range of motion, and MRI findings.

Conclusion

Cervical myelopathy is a condition that can also be seen in the pediatric population and should be kept in mind in the diagnosis. Proper diagnosis requires a clinical awareness of these unusual issues. Cervical spinal cord decompression with cervical laminoplasty may be the ideal treatment for pediatric patients.

Informed Consent: Informed consent was obtained from the patient's family.

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