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Case Report

Acute Paraplegia After Spinal Manipulation: A Case Report

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This is a case report about a 53-year-old female patient with a history of chronic back pain, suffered from complete paraplegia shortly after spinal manipulation. CT and MRI images consistently showed ossification of the ligamenta flava in conjunction with bilateral facet joint hypertrophy at the T10-11, T11-12 and L1-2 levels. Spinal cord injury with T12 paraplegia ASIA-A was thus diagnosed. Posterior laminectomy at the T10, T11, L1 and L2 levels and interbody fusion from T10 to L2 spines for fixation were performed. After rehabilitation, the patient regained some activities of daily living despite complete paraplegia. To raise public awareness, our report highlights the risk of acute paraplegia after forceful spinal manipulation. Furthermore, prompt evaluation and intervention is necessary when symptoms were worsen or neurological deficits were developed. (Tw J Phys Med Rehabil 2011; 39(4): 247 - 252)

Key Words: paraplegia, spinal manipulation, spinal cord compression, ligamentum flavum, facet joint hypertrophy

INTRODUCTION

Low back pain is one of the most common musculoskeletal problems in modern society. In Taiwan, a commonly sought treatment is spinal manipulation by physical therapists or chiropractors. Such manipulation is claimed as a safe therapy, in comparison with surgery or drug treatment. However, its cost-effectiveness has not been established and neurological complications have been reported, including exacerbation of nerve root pain, cauda equina syndrome and even death. Although it is rare to result in severe thoracic cord compression from a combination of ossification of ligamenta flava and hypertrophy of bilateral facet joints following back-extending thrusts, we present in this study an unusual case of acute paraplegia developed shortly after thoracolumbar spinal manipulation therapy. Clinical course is described and pathophysiological hypotheses are discussed.

CASE REPORT

A 53-year-old female factory worker had persisting low back pain with radiating numbness to bilateral lower extremities for 6 months. After receiving various therapies without improvement, she consulted a Chinese bonesetter and received spinal manipulation. She noted severe back pain with radiation to bilateral lower extremities and weakness in both lower limbs at the moment of receiving forceful hyperextension thrusts twice to the...
back while lying prone (by elevating her leg one side at a time). She could hardly sit up and the pain over her back did not subside until 2 hours after such treatment. Six hours later, she was first sent to a hospital with the diagnosis of acute spinal cord injury. Steroid was given there. Then, she was sent to the emergency department of a medical center for pre-operative preparation.

When she arrived the emergency room, she had grade 0/5 motor strength in both lower extremities, absent deep tendon reflexes and complete sensory loss below the T12 level. Urinary retention was also observed and a Foley tube was therefore inserted. Blood and urinary analyses, including erythrocyte sedimentation rate and C-reactive protein, were found to be normal.

A magnetic resonance imaging (MRI) scan showed hypointense posteriorly located lesions at the T10-11 and T11-12 levels, causing compression of the spinal cord. Similar but smaller lesions were identified at the L1-2 level (Figure 1 and 2). A computed tomography (CT) scan revealed decreased spinal canal caused by the combination of ossification of ligamenta flava and hypertrophy of bilateral facet joints at the T10-11, T11-12 and L1-2 levels (Figure 3). However, emergency operation was not performed because of the patient’s personal reasons. It was two days later that the patient received surgical interventions of posterior laminectomy with removal of the ossified ligaments and interbody fusion for spinal fixation from T10 to L2 levels. Histopathological examination of the specimens disclosed bone tissue, fibrocartilaginous tissue and fragments of ligamentum flavum without any tumorous component.

The postoperative course was smooth. However, the patient did not recover either the strength or the sensory deficit after operation. Fourteen days after surgery, she was transferred to the rehabilitation department with no neurological improvement. The motor strengths in both lower extremities were still grade 0/5, deep tendon reflexes were absent and sensory function below the T12 level was completely lost. Spinal cord injury with T12 paraplegia ASIA-A was impressed. She needed maximal assistance to sit up and the Functional Independence Measure (FIM) scores were 17/35/52. The urodynamic studies disclosed the mixed type neurogenic bladder with detrusor areflexia and non-relaxing sphincter. Patient used thoracolumbar orthosis for 3 months after surgery.

Four months after surgery, bilateral ankle jerk reflexes started to appear. At the 6-month follow-up, her neurological status was unchanged with neurogenic bladder dysfunction under intermittent catheterization every 6 hours. Nevertheless, she had stronger muscle power in both upper extremities and was able to walk for a few meters with a walker and the support by gaiters for both
legs. The patient’s FIM scores improved to 47/35/82. Thus, the patient’s daily activities were mildly dependent after rehabilitation.

DISCUSSION

Spinal manipulation is a form of alternative therapy commonly used to correct spinal malalignment. Manipulation of the spine differs from mobilization: Manipulation involves a sudden thrust (high velocity and low amplitude) that cannot be resisted by the patients, whereas mobilization involves a passive movement that can be stopped by the patient.[5] However, this treatment method is not without risk. Complications of spinal manipulation have been presented in a number of case reports, small series, and literature reviews. A review literature by Patijn showed a complication rate in 1 of 518,886 manipulations.[6] The most frequent complications were vertebral artery injury (65.1%) and intervertebral disc complications (22.5%). The incidence of serious complications after spinal manipulation was estimated to be from 1 in 400,000 manipulations to over 1,000,000 manipulations.[7,8] Also, the degree of underreporting is likely to be high.[9,10] The literature reviewed by Gouveia et al revealed that the most frequent serious adverse event was stroke and others including subdural hematoma, spinal fluid leak, cauda equina syndrome, herniated disc, diaphragmatic palsy and bone fracture.[7]

Neurological complications can be divided into cerebrovascular and non-cerebrovascular accidents. Most of the reports have focused on cerebrovascular complications which are largely related to cervical manipulation. It is our understanding that there is only one case series discussing nonvascular complications following spinal manipulation.[11] In this case series, 16 of the 18 patients required surgery and their MRI/CT findings were mainly herniated nucleus pulposus (HNP). Most of the surgeries for decompression had involved discectomy, laminectomy or vertebrectomy. Nonetheless, none of this case series had the same mechanism of injury as described in our present case.

Spinal stenosis is a common condition and also one of the most common reasons to perform spinal surgery.[12,13] Spinal stenosis is the result of a combination of factors,[14] which include thickening of ligamenta flava and hypertrophy of facet joints that are part of degenerative processes in the spine. Facet joint changes are usually secondary to disc degeneration and collapse of the disc, further diminishing the spinal canal at the intervertebral level. Due to this disc collapse and decrease in intervertebral height, the thickened ligamentum flavum may buckle,[15] thus further decrease canal space. Furthermore, ossification of the ligamentum flavum (OLF) may occur. Many studies have revealed that ossification of ligamentum flavum are more frequent in stenotic than nonstenotic persons.[16]

Hypertrophy of the facet joints in the thoracic spine is rare.[17] Nevertheless, ossification of the ligamentum flavum is thought to be prevalent in East Asian individuals, but more cases in the non-Asian population have been reported.[18] The higher prevalence in East Asia may implicate genetic or environmental factors. Also, OLF has
been associated with ossification of the posterior longitudinal ligament (OPLL), diffuse idiopathic skeletal hyperostosis (DISH), Paget’s disease, diabetes and obesity.\[19\] However, the pathogenesis remains unclear. Thoracic OLF is most commonly found in the lower third of thoracic spine. Kudo found the mean prevalence of OLF to be 6.2% for male and 4.8% for female Japanese individuals in the thoracic spine.\[20\] The combination of MRI and CT is important in the diagnosis of OLF.\[21\] While CT scanning best demonstrates the characteristic contours and density of the ossific changes, MRI can show the exact location and extent of the compression in several planes. Histologically, ossification of the spinal ligaments reported by Ono et al have the characteristics of ectopic bone formation within the ligaments, fibrocartilaginous cellular proliferation followed by ossification and tissue resorption with vascular ingrowth.\[19\] Laminectomy with removal of the ossified ligament is the most commonly performed procedure. Besides, postoperative kyphosis and recurrence or development of ossification at other levels have been reported, so later follow-up is recommended.\[22\]

Although previous CT or MRI images of the patient were not available, the degenerative changes were found to include ossification of ligamentum flavum and hypertrophy of facet joints, which should have existed before the injury due to the nature of its slow progression. The forceful hyperextension thrusts made these structures protruding further into the spinal canal and leading to severely compressed spinal cord. In view of such complication, the need for pre-manipulation MRI or CT scanning should be emphasized to rule out the presence of significant risk factors, such as substantial disc herniation, occult malignancies\[11\] or ossification of ligamentum flavum and hypertrophy of facet joints as was the present case. Another critical issue raised in the present case is the promptness of treatment. Preoperative duration of symptoms and neurological score was suggested to be predictive of surgical outcome for ossification of the ligamentum flavum of the thoracic spine.\[23\] Neurological improvement secondary to decompressive laminectomies depends on the degree and duration of spinal cord compression.\[11,24\] Thus, prompt neurosurgical intervention may result in a better outcome. However, in this case, the operation had been delayed for 2 days, which may contribute to the complete paraplegia of the patient even up to 6 months after surgery.

**CONCLUSION**

We present a case of spinal cord injury with T12 paraplegia ASIA A after spinal manipulation. Paraplegia is an uncommon but serious complication. The most common cause is disc herniation. Spinal cord compressed by the protrusion of ossified ligamentum flavum and hypertrophic facet joints after spinal manipulation is rare. Acute paraplegia should be added as a potential complication of lumbar spinal manipulation, especially after hyperextension thrusts to the back. Moreover, the effectiveness and cost of spinal manipulation are uncertain. Complications should be considered and weighed against the potential benefits of such treatment.

**REFERENCES**


整脊後導致急性截癱：病例報告

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此案例是一名有慢性背痛病史的 53 歲女性，因整脊導致完全性截癱。CT 和 MRI 圖像均顯示在 T10-11、T11-12 及 L1-2 等處合併有黃韌帶的骨化(ossification of ligamenta flava)和雙側的小面關節肥大(facet joint hypertrophy)。經診斷為脊髓損傷，T12 截癱，ASIA-A。之後進行外科手術，在 T10、T11、L1 和 L2 進行椎板切除術(laminectomy)合併從 T10 到 L2 的椎間融合(interbody fusion)以利固定。經過術後的復健，病人雖然還是完全性截癱，但有提昇日常生活活動的功能性與生活品質。期望藉由本文讓社會大眾瞭解和注意整脊後可能發生急性截癱的風險。此外，當有症狀的惡化或是神經學上的症狀產生時，必須要及時的評估和治療，以避免造成不可挽回的傷害。（台灣復健醫誌 2011；39(4): 247 - 252）

關鍵詞：截癱(paraplegia)，整脊(spinal manipulation)，脊髓壓迫(spinal cord compression)，黃韌帶(ligamentum flavum)，小面關節肥大(facet joint hypertrophy)

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