Anterior and Posterior Fixation of a Cervical Fracture Induced by Chiropractic Spinal Manipulation in Ankylosing Spondylitis: A Case Report

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Ankylosing spondylitis (AS) is a well-known seronegative arthritis characterized by inflammation of the axial spine and sacroiliac joints. In long-standing AS, syndesmophytosis, accompanied by osteoporosis of the entire spine, results in a rigid and brittle bamboo-like spine, which is easily broken in the face of external force.1 The fused cervical spine is especially prone to such an injury.2,3 Chiropractic spinal manipulation (CSM) is a popular physical therapy for nonspecific back and neck ache.4 Although chiropractic is claimed to be harmless, some complications, such as cerebral vascular accidents, myelopathy and radiculopathy, have occurred.5 Rare cases of fracture dislocation of the cervical spine, resulting from CSM, have been reported.6 We encountered such a patient whose bamboo spine was unintentionally fractured during CSM. The associated neurologic deficits and functional impairments improved dramatically after combined anterior and posterior surgical decompression with three-column internal instrumentations.7 After this type of surgical management, a noninvasive external orthosis, such as a four-poster brace, can afford sufficient postoperative cervical support to obviate potential complications and the intolerable confining nature of halo-vest immobilization.

CASE REPORT

Presentations

A 66-year-old man suffered from long term AS, and his spine became fused with a bamboo-like appearance 20 years ago. Although the neck was fixed in a flexion posture with a kyphotic angle of thirty degrees, his horizontal vision could be maintained. Because of subjective neck stiffness, he attended a conventional Chinese medical clinic where CSM was performed. He did not have cervical trauma or neck pain before the CSM. During a passive neck extension exercise, he experienced acute excruciating neck pain associated with a tingling sensation in both hands after a subjective click of the neck. Although he could walk slowly without support after the manipulation, ascending numbness into the trunk and weakness in both legs progressively worsened 2 days after CSM. However, he did not pay attention to the abnormal sensations of trunk until 1 week after the CSM when he became quadriplegic and bedridden. The patient was first brought to a local clinic where incomplete quadriplegia with urinary retention was recorded necessitating placement of a Foley catheter. Plain films of the cervical spine revealed a fracture angulation of stick-like spine at the level of C6 vertebral body (Fig. 1). After an intravenous megadose of methylprednisolone was infused, the patient was transferred to our hospital with his neck fixed in the preinjury flexed posture with a Philadelphia collar.

Examinations

In our emergency room (ER), the patient lay still because of severe neck pain. Examinations of the cranial nerves were unremarkable. Based on the standard classifications of spinal cord injury developed by the American Spinal Injury Association (ASIA), the powers of the key muscles of the upper limbs ranged from two to three grades on the right and three to four on the left.8 Meanwhile, the powers of the key muscles of the lower limbs ranged from 0 to 1 on the right and two to three on the left. He did not experience a deterioration of muscle power during the hospital transfer. Hypoesthesia to pin pricking was noted below the T1 dermatome, but allodynia was experienced at the C6 to C8 dermatomes. Joint position sensations were impaired in the fingers, ankles, and toes. The external sphincter contracted tightly during the digital examination. Based on the ASIA8 and the Nurid grades9 (grade 1, normal walking with possible clinical spinal irradiation; grade 2, slight difficulties in walking with normal domestic and working life; grade 3, functional disability limiting normal work and domestic activities; grade 4, significant weakness making walking impossible without help,
and grade 5, bedridden or wheelchair bound), the patient was coded as ASIA grade C and Nurid grade 5 at the ER.

Magnetic resonance (MR) images of the cervical spine revealed a bursting fracture spanning the inferior portion of the C5 and the superior portion of the C6 vertebrae, and the fracture line extended to the posterior element between C6 and 7 (Fig. 2). Bone fragments compressed the spinal cord both anteriorly and posteriorly. A posterior epidural lesion at the fracture site was suspected to be an epidural hematoma because of the heterogeneous intensity on T2-weighted images. Extreme instability of the fracture was evident, because the alignment was reduced spontaneously when the patient lay in the supine position for MR imaging. Although cranial cervical traction was performed to keep the alignment straight after MR imaging, the neurologic deficits did not improve. In addition to the slowly progressive nature of the neurologic deficits, emergency surgical decompression of the spinal cord with internal fixation of the fracture was considered to be necessary to prevent further deterioration.

Operations

Fours hours after performing the MR imaging, the patient was transferred to the operating room. Awakened nasal endotracheal intubation was performed with the patient’s head maintained in preinjury alignment. General anesthesia was induced after neurologic examinations confirmed that no further deterioration of the neurologic deficits had occurred after intubation. The surgical procedures were performed with the head and neck positioned in the pre-anesthetic posture. Anterior corpectomy of the fractured C5 and upper portion of the C6 was initially performed, until the dural sac had expanded fully. Interbody fusion followed by Caspar plating was achieved with an autogenous left iliac graft measuring 2.8 cm. Two more screws were put into the C7 vertebral body, because the residual C6 body might not have been able to hold the screws securely, and one screw had penetrated the ossified C6-7 disc space. The T2-weighted MR image revealed a posterior indentation of the spinal cord because of a fractured bone chip, so the patient underwent laminectomy after the anterior corpectomy was finished. Partial C5 and complete C6 laminectomy was performed with the patient in a sitting position. The impinging ossified yellow ligament and the posterior epidural fusiform lesion, histologically confirmed to be a subacute epidural hematoma, were removed. Fracture lines could be found crossing the ossified C6-7 interspinous ligament and the bilateral corresponding facet joints. Plates and screws (14 × 4 mm) were affixed to the bilateral C6 and 7 lateral masses after laminectomy, and achieved an immediate three-columned rigid fixation (Fig. 3). Posterior bone grafting was not performed.

Postoperative Course

Because the combined anterior and posterior internal plates fixation had achieved immediate three-column stability...
in the operation, the patient was able to wear a four-poster cervical brace for postoperative external immobilization. The Foley catheter was removed on the postoperative fourth day, with good self-voiding. The muscle powers of key muscles of the upper and lower limbs rapidly recovered to four to five grades 1 week after operation. Meanwhile, allodynia of the hands and hyposthesia of the trunk had almost disappeared. He was transferred to the rehabilitation department on the 7th postoperative day, with neurologic deficits improved to ASIA grade D and Nurick grade 3. Despite minimally residual numbness in both hands, he completely regained motor function and returned to work as a farmer 3 months after operation (Nurick’s grade 1). Rigid bone fusion was achieved 6 months after operation.

DISCUSSION

AS is a male predominant, HLA-27-associated, and spondyloarthritides characterized by inflammation of the sacroiliac, the hips, and the articular joints of the axial spine. Over 50% of patients with AS will suffer from moderate to severe spinal restriction in the late stage of the disease, and they are usually complicated by vertebral osteoporosis because of prolonged immobilization. In long-standing disease, ossification of the ligaments and joints of the involved spine occurs, and leads to universal spinal syndesmophyosis (bamboo spine). Spinal fracture is 3.5 times more common in AS patients than in the normal population. Even in the face of minor external stress, the rigid and brittle fused spine is easily broken because of the altered biomechanics, which leads to the spine behaving much like an osteoporotic long bone rather than an elastic spine. The cervical spine is especially prone to such an injury, because the protecting muscle is weak and the supporting paravertebral soft tissues are ossified. Minor trauma, such as a fall during walking or from a standing height, is the most common cause of cervical spinal fracture in AS patients. In Taiwan, as in the United States, CSM is a popular physical therapy for nonspecific back and neck ache. Although the general population views chiropractic as harmless, some undesired complications have been reported, such as stroke or myelopathy, injury to the vertebral artery, spinal cord injury, aggravation of symptoms related to herniated intervertebral disc and, rarely, fracture dislocation of the vertebral column. Blaine reported three chiropractic atlanto-axial dislocations in which a patient with odontoid fracture died of progressive quadriplegia because of his removing the cervical collar against medical advice. Rinsky reported a C3-4 fracture with C4 quadriplegia after CSM in an AS patient. Despite surgical decompression and internal fixation, the neurologic deficits did not recover. Schmidley reported an AS patient who developed an incomplete cervical myelopathy below C7 because of C6-7 spondylitic canal stenosis after a minor fall. The myelopathy was aggravated after a CSM that also caused a fracture of the left transverse process of the C7. Fortunately, the neurologic deficit improved after cervical disectomy and fusion. All these patients, including ours, first presented with sudden excruciating neck pain during CSM followed by progressive neurologic deficits because of gross spinal instability and neuronal element compression. Thus, violent spinal manipulation bears a potential danger not only to the cervical vasculature but also the skeletal system. Physicians caring for patients with rheumatological spinal pathology should warn them of the potential danger of CSM.

Fractures of the cervical spine in AS patients are accompanied with a high incidence of severe neurologic deficits and mortality. Murray reported a 57% rate of severe neurologic deficits (quadriplegia and paraplegia), and a 35% mortality rate associated with vertebral fracture in AS patients (three times and twice more frequently than the normal population, respectively). The prognosis of severe neurologic deficits (quadriplegia or paraplegia) associated with vertebral fracture in AS patients is generally poor. In a multicentric analysis, Apple pointed out that merely 4 out of 35 nonsurgically treated patients and 2 out of 22 surgically treated patients had neurologic improvement at the last follow-up. Ticó collected 13 AS patients with cervical spinal fracture and spinal cord injury. Among them, 6 of 12 patients who were not operated on died, and only one had neurologic improvement, from ASIA D to E. Whether AS patients with spinal fracture
and spinal cord injury should be treated with surgery followed by external immobilization, or with external immobilization alone, remains controversial. In early reports, because of a relatively high prevalence of respiratory complications and minimal neurologic recovery after surgical fixation, some authors suggested that conservative treatment, such as cranio cervical traction followed by Halo-vest immobilization, would be the first choice of treatment for cervical spinal fracture complications in AS patients. Although secure immobilization in a Halo-vest after well close reduction can achieve rapid bone union, it may only be performed in patients without spinal cord compression. Any neurologic deficits resulting from spinal cord compression by epidural hematoma, or intervertebral disc herniation, warrant surgical decompression. Surgical intervention is also indicated in the management of fractures that fail to be stabilized with nonoperative devices. After surgical decompression and internal instrumentation, it was generally recommended that postoperative halo-vest immobilization would be required to prevent early instrument failure and facilitate bone union. However, facing ample complications and the intolerably confining nature of halo-vest immobilization, the cervical collar or cervico-thoracic brace have replaced the halo-vest after the internal fixation of cervical fracture in some AS patients. Taggard and Traynelis treated cervical fracture in seven AS patients with three-point posterior instrumentations, followed by a cervical collar as external immobilization. None experienced postoperative neurologic deterioration, and all achieved rigid bone fusion. Taggard and Traynelis also mentioned that combined anterior and posterior instrumentations might be necessary when the structural integrity of the vertebral body is significantly compromised, and overt instability of the fracture is present. Our case provided an opportunity to perform this type of 360 degree internal fixation. Although combined anterior and posterior decompression can thoroughly decompress the spinal cord, they also completely destroy the three-columned stability required for interbody bone fusion. After such management, the postoperative halo-vest can be replaced safely with a four-poster thoracocervical brace.

CONCLUSIONS

Physicians caring for patients with rheumatological spinal pathology should be aware that CSM is dangerous, and should be avoided, if possible. Fractures of the cervical spine in AS patients carry a high incidence of severe neurologic deficits and mortality. This study supports the notion that thorough surgical decompression can rescue spinal cord function, if neurologic deficits develop because of spinal cord compression at the fracture segment. Combined anterior and posterior instrumentations can restore the immediate three-columned stability required for interbody bone fusion.

REFERENCES


