



TRAUMATIC SPINAL CORD INJURY DUE TO HORSE RIDING ACCIDENT IN A PATIENT WITH KLIPPEL-FEIL SYNDROME: A CASE REPORT

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ABSTRACT

Background: Spinal cord injury is a severe medical illness that frequently leaves patients permanently disabled and with severe morbidity. In some cases, sports may be one of the factors causing spinal cord injuries, such as horse riding. Anatomical variation in the vertebrae may become a potential risk factor for an injury such as Klippel-Feil syndrome.

Case: A 30-year-old female came to the emergency room after falling while riding a horse. The patient complained of not being able to move her hands and feet and feeling numb from the neck area to the feet. X-rays of the cervical spine showed an anatomical variation in fusion at the C4 and C5 vertebrae, known as Klippel-Feil syndrome. No visible fracture or dislocation was found. The MRI results showed intramedullary lesions at the C3 to C5 vertebral body level and a compression fracture of the C4-C5 vertebral body, accompanied by narrowing of the C4-C5 intervertebral disc.

Discussion: Patients with Klippel-Feil syndrome may be more vulnerable to transient neurologic deficits after minor trauma. The fused segments' altered mechanical force transfer, which results in the adjacent non-fused segments moving excessively, is most likely related to this.

Conclusion: Serious medical conditions like spinal cord injuries often leave victims severely sick and permanently incapacitated. Sports such as horse riding are associated with traumatic spinal cord injuries. Patients with Klippel-Feil syndrome may be more susceptible to this trauma.

Keywords: horse-riding, Klippel-Feil syndrome, spinal cord injury



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Introduction

Spinal cord injury is a severe medical illness that frequently leaves patients permanently disabled and with severe morbidity. Disruption of the axons of the nerves passing through the spinal cord can result in loss of motor and sensory function below the injury site. Major trauma is typically the cause of injury, and initial injury is frequently irreversible.¹ Even though the genesis of these injuries has been documented to be primarily related to motor vehicle accidents and falls, another significant contributing factor to traumatic SCI is sports injuries.^{2,3} A study by Boran et al in 2011

concluded that equestrian events were the most common sport responsible for a spinal injury (41.8%).⁴

In some cases, anatomical variation in the vertebrae may become a potential risk factor for an injury such as Klippel-Feil syndrome. Klippel-Feil syndrome is a congenital fusion of two or more cervical vertebrae. The hypermobility of the various cervical segments in people with Klippel-Feil syndrome and cervical stenosis may put them at risk for spinal cord injury following mild trauma.⁵ We report a case of traumatic spinal cord injury in patients due to falls during horse riding in patients with Klippel-Feil syndrome.

Case Report

A 30-year-old woman arrived at the ER with her family after falling from a horse two hours earlier. When she fell, her head was bent forward. The patient had ridden before and used a full range of equipment when riding. The patient complained of not being able to move her hands and feet and feeling numb from the neck area to the feet. X-rays of the cervical spine showed fusion at the C4 and C5 vertebrae caused by anatomical variation (Klippel-Feil syndrome) and no visible fracture or dislocation.

The MRI results showed intramedullary lesions at the level of the C3 to C5 vertebral bodies, which gave isointense signal changes with some hyperintense at T1WI and hyperintense at T2WI, and spinal cord edema at the level of the C3-C5 vertebral bodies, e.g., trauma. Fractures of the C4 spinous process and the left C2 transverse process were accompanied by bone marrow edema, narrowing of the C3-C4 interspinous distance, and changes in signal intensity in the C4-C5 intervertebral disc, which gave an isointense signal on T1WI and hypointense on T2WI (Figure 1). Compression fracture of the C4-C5 vertebral body accompanied by narrowing of the C4-C5 intervertebral disc (Klippel Feil syndrome) (Figure 2). While in the emergency room, the therapy given was ABC management, collar neck installation, and high-dose methylprednisolone 30 mg/BW loading in 15 minutes, followed by a maintenance dose of 5.4 mg/ BW in 23 hours. Due to limited facilities and supporting examinations, we referred the patient to a more adequate hospital.



Figure 1. Lateral view of the cervical spine demonstrates a congenital fusion between the vertebral bodies of C4 and C5. There is no evidence of fracture or dislocation observed in this image, and the alignment of the surrounding vertebrae appears preserved

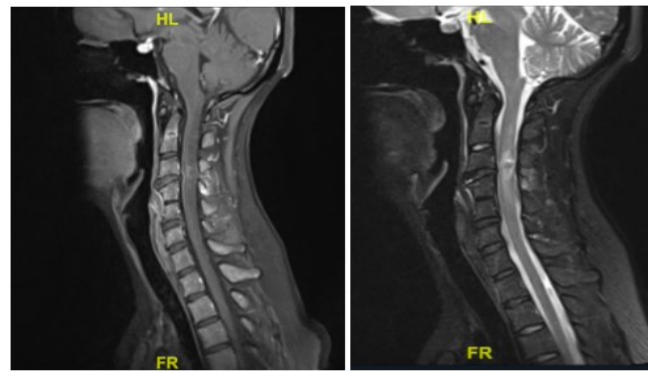


Figure 2. T1WI and T2WI MRIs of the cervical spine showed intramedullary lesions at the level of the C3 to C5 vertebral bodies and accompanied compression fractures of the C4–C5 vertebral bodies accompanied by narrowing of the C4–C5 intervertebral disc (Klippel Feil syndrome)

Discussion

Spinal cord injury is commonly caused by a sudden, traumatic impact on the spine that fractures or dislocates the vertebrae. Primary damage occurs when "displaced bone fragments, disc materials, and ligaments bruise or tear into the spinal cord tissue." This indicates that first-order mechanical forces injured the spinal cord.^{6–8} Notably, most injuries do not completely sever the spinal cord.⁹ Four main characteristic mechanisms of primary injury have been identified that include: (a) Impact plus persistent compression; (b) Impact alone with transient compression; (c) Distraction; (d) Laceration/transection.⁷ Impact with persistent compression, which usually results from fracture-dislocation injuries or burst fractures with bone fragments compressing the spinal cord, is the most frequent type of primary injury.^{10,11}

A study by Boran S. et al. in 2011 concluded the most common sport responsible for a spinal injury was equestrian or horse-riding events (41.8%), followed by rugby (16.3%), diving (15.3%), Gaelic football (8.1%), cycling (4.2%), hurling (1.5%), and miscellaneous (12.7%). Injury distribution was cervical spine (118 patients, 60%), thoracic spine (41 patients, 21%), and lumbar spine (37 patients, 19%). In 18 patients (9.25%), more than one region was affected. In 78 patients (40%), more than one vertebral level was affected.⁴

Horse riders risk serious injuries due to the high speeds involved and the unpredictable nature of working with horses. It sustains more accidents per hour of sport compared with motorcycle riding, skiing, and football. When riding a horse, the rider's head is around 8 to 9 feet above the ground, which increases the possibility of head or spinal injuries in the event of a fall.¹² Many horse riders engage in their sport for years, and experience does not entirely mitigate injury risk. Injured equestrians are more likely to be amateurs

or less experienced riders, and they also may be riding horses with less training experience. Experience is postulated as a protective factor, and human error has been cited as contributing to injuries in over a third of accidents.^{13,14}

A retrospective analysis of data from the U.S. National Electronic Surveillance System between 2002 and 2004 revealed 123 instances of spinal injuries, both with and without neurological impairments, among horse riders who visited emergency rooms following an injury connected to riding.¹¹

Spinal cord injury can have severe neurological repercussions, but it is comparatively rare in horses. The U.S. National SCI Statistical Center database was examined retrospectively, and it was discovered that C4-C6, T12, and L1 were the most often seen levels of retained neurologic function following SCI. Complete paraplegia (24%), incomplete paraplegia (19.8%), and incomplete tetraplegia (41%) were the most prevalent outcomes of SCI from riding incidents. Complete tetraplegia was less common (8.3%).¹¹ In this case, we found a patient with a spinal injury to the C4 and C5 vertebrae with complete tetraplegia.

Tetraplegia is the outcome of SCI in the cervical region. When neural components inside the spinal canal are damaged, the resultant impairment or loss of motor or sensory function in the cervical regions of the spinal cord is referred to as tetraplegia. The end effect is a reduction in the function of the arms, trunk, legs, and pelvic organs.¹⁵ The lowest sacral segments (S4–S5) in a complete cervical SCI lack sensory or motor function. Incomplete damage occurs when sensory or motor function is partially preserved in the lowest sacral segments and below the neurologic level.¹⁶ Muscle paralysis, sensory impairment, and autonomic impairment (including problems with the bladder, bowel, and sexual organs) are the main symptoms of cervical SCI.¹⁷ From the results of the cervical x-ray examination, it turned out that the patient had a fusion of the vertebrae, or what we call Klippel-Feil syndrome.

Klippel-Feil syndrome (KFS) is characterized by the abnormal fusion of two or more vertebrae in the cervical spine. It gives the appearance of having a short neck, resulting in a low hairline, asymmetrical facial features, and restricted neck movement. Klippel-Feil syndrome has been classified into three categories. Type 1: Cervical spine fusion in which elements of many vertebrae are incorporated into a single block. Type 2: Cervical spine fusion in which complete segmentation fails at only one or two cervical levels and may include an occipital-atlantal fusion. Type 3: Type 1 or 2 fusion with co-existing segmentation errors in the lower dorsal or lumbar spine.¹⁸

Patients with Klippel-Feil syndrome and cervical stenosis may be more vulnerable to severe neurologic

deficits after minor trauma. The fused segments' altered mechanical force transfer, which results in the adjacent non-fused segments moving excessively, is most likely related to this.¹⁹ People with Klippel-Feil syndrome should be given the proper instructions to change their behavior if they encounter an episode of neurologic compromise, because they may be more likely to sustain a neurologic deficit in the setting of spinal stenosis following minor trauma. For those with Klippel-Feil syndrome, choosing a career and leisure activities will be easier if they are aware of the possibility of spinal cord injury after a prior episode of neurologic compromise.¹⁹⁻²¹

Conclusion

Sports such as horse riding are associated with a heightened risk of traumatic spinal cord injuries (SCI). These activities can lead to severe injuries that may result in permanent disability and significant morbidity. Patients with anatomical variations, such as those seen in Klippel-Feil syndrome, may be particularly vulnerable to such injuries. The congenital fusion of cervical vertebrae alters the biomechanics of the spine, making these individuals more susceptible to trauma even from relatively minor incidents. Therefore, awareness and careful management of individuals with Klippel-Feil syndrome, especially those engaged in high-risk sports, are essential for preventing potential spinal cord injuries. This case emphasizes the need for thorough evaluation and monitoring of patients with anatomical variations, particularly in the context of physical activities that pose a risk for spinal injury.

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