

Spinal Cord Injury Without Radiographic Abnormality (SCIWORA) in a Young Man: Case Report

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✓ Spinal cord injury without radiographic abnormality (SCIWORA) often occurs in the immature cervical spinal skeleton. It is most commonly found pediatric age group. Different clinical results ranging from temporary loss of sensation and motor function to complete spinal cord injury may result. In this reports a young patient with this diagnosis involving the cervical spine with resultant quadriplegia is described. The relevant literature is reviewed and discussed.

Key words: Spinal trauma, SCIWORA, adult, outcome

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Genç Bir Erkek Hastada Radyolojik Bulgu Olmaksızın Spinal Kord Yaralanması: Olgu Sunumu

✓ Radiografik olarak patolojik bulgu vermeden spinal kord yaralanması sıklıkla immatür servikal spinal vertebralarda oluşur. En sık pediatrik yaş grubunda rastlanır. Komplet spinal kord yaralanmasından değişik derecelerde duyu ve motor defistlere neden olabilen fraklı klinik bulgular verebilir. Bu çalışmada quadriplesjiye neden olmuş SCIWORA tanısı almış bir genç hasta literatür eşliğinde sunuldu.

Anahtar kelimeler: Spinal travma, SCIWORA, erişkin, sonuç

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Spinal cord injury without radiographic abnormality (SCIWORA) is a clinical syndrome of acute traumatic myelopathy, well documented in the pediatric literature ⁽¹⁴⁻¹⁷⁾. Radiological examinations including x-ray radiographic and computed tomography (CT) are normal, while magnetic resonance imaging (MRI) should demonstrate abnormalities, such as spinal cord edema, contusion, meningeal ruptures in all cases ⁽⁶⁾. The incidence, pathogenesis, and severity of SCIWORA are different in various age groups, because of anatomical and biomechanical differences in the spine ⁽¹³⁻¹⁵⁾. The incidence of SCIWORA in pediatric groups is

more frequent than the adults, due to the relatively large size of the head and the greater inherent mobility in the immature axial skeleton and neck muscles, combined with ligamentous laxity or disruption ^(2,12). It is exceedingly rare to find closed spinal trauma without skeletal injuries or dislocation in adult patients. The mechanism of spinal cord injuries cannot satisfactorily be explained owing to different biomechanical and anatomic characteristics in these patients ^(1,8,11,22). An adult SCIWORA case is presented in this report, which led to complete spinal cord injury.

CASE REPORT

A 21-year-old man was admitted with quadriplegia and general body trauma to the emergency service of Erzurum Military Hospital, after a fall on the ground from the couchette, during sleeping. Systemic examination findings were normal, and neurological examinations revealed a sensory level at C3, and quadriplegia. Cervical spine was immobilized with a collar and cervical static x-ray graphics and CT studies were carried out (Figure 1A, 1B and Figure 2). No bony

injury was apparent. Cervical MRI showed marked constitutional narrowing of the cervical spinal canal at C3-C4 levels with edema and contusion of the cord on T2 weighted images (Figure 3 and Figure 4). No further pathology, such as disk herniation, stenosis, and spondylosis was observed. The patient was followed up in the intensive care unit. The conservative treatment was applied to the patient with overdose methyl-prednisolone and hyperbaric oxygen therapy. Cervical hyper-flexion and hyperextension x-ray graphic studies were carried out to

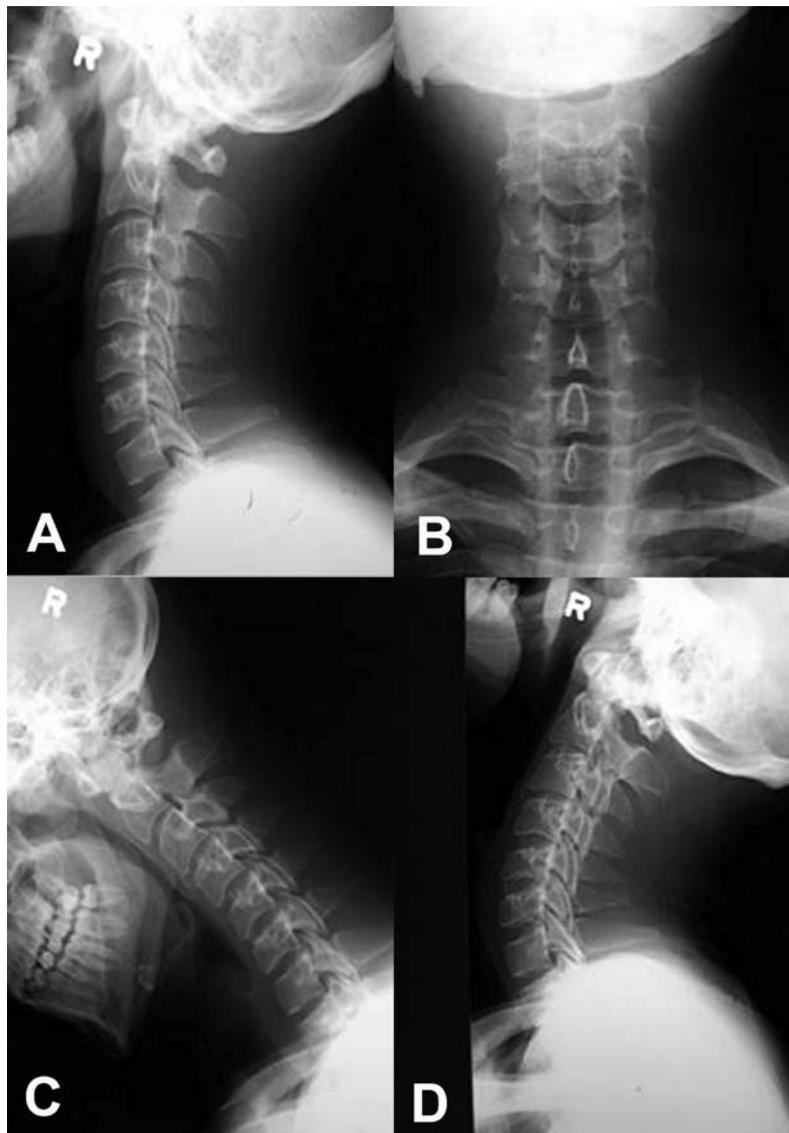


Figure 1. The alignments of the vertebral bodies are normal and there were no traumatic pathologies in lateral (A), anterior-posterior (B), hiperflexion (C) and hyperextension (D) cervical spine x-ray graphics.

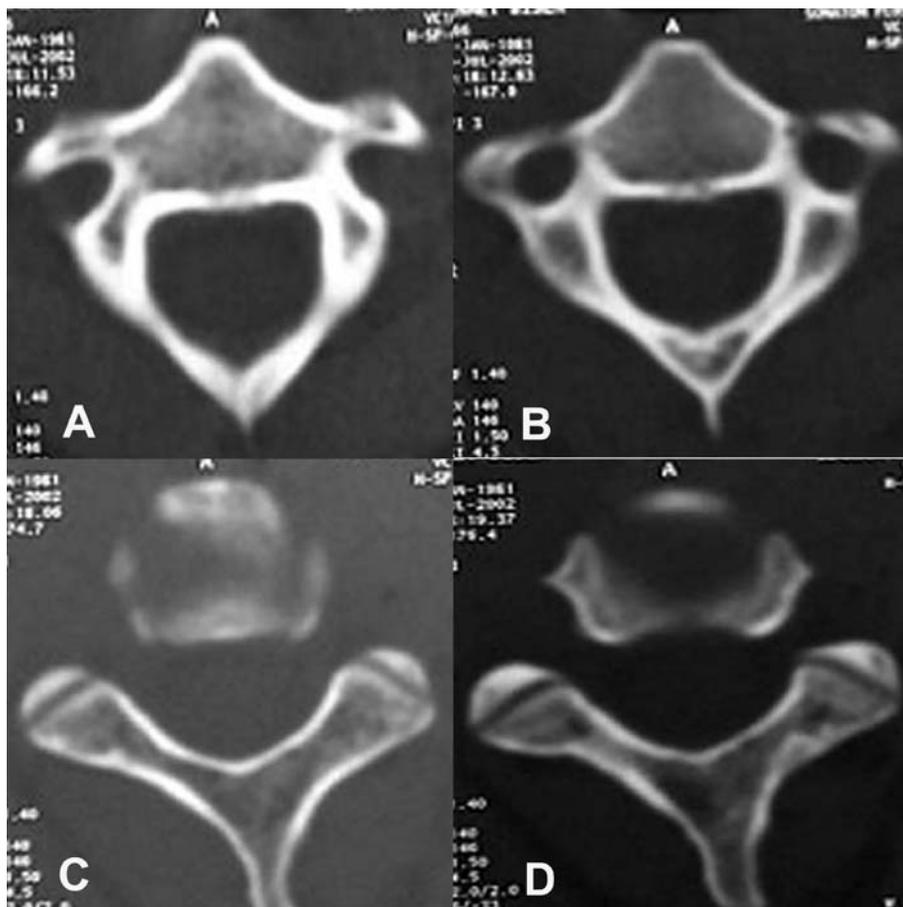


Figure 2. There were no traumatic pathologies in bone window axial CT images at the level of C3-4.

find out ligamentous instabilization ten days following the trauma and it was discovered that abnormal segmental mobilization did not exist (Figure 1CD). No improvement was observed in the loss of motor and sensation function of the patient and, thus, he was transferred to the physical therapy and rehabilitation clinic. After a period of six months, the clinic reported that there was no improvement in the neurological examination of the patient.

DISCUSSION

SCIWORA was first described by Pang and Wilberger in 1982, as spinal cord injury without radiological evidence of trauma, and defined as a clinical and radiological entity that presents as acute traumatic myelopathy with normal radiographic and CT scan findings ⁽¹⁶⁾. Although

SCIWORA is seen in all ages, developed easily in infants and children up to 8 years and the elderly above the age of 60 years more than young people between 16 and 35 years ^(7,21). However, after 40 years of age, SCIWORA may be common in patients with preexisting cervical spondylosis ^(10,18,19). All levels of the spinal cord injuries are susceptible to SCIWORA. As in the present study, the cervical cord is most frequently affected, followed by the thoracic and lumbosacral regions ^(4,14,15).

Compared with the adults, the reason for the higher incidence of SCIWORA among children is attributable to the fact that children have more horizontal facet joints, vertebral bodies with a curved shape anteriorly and more elastic ligaments and joint capsules ^(3,9,15,16). These anatomic traits allow excessive intersegmental move-

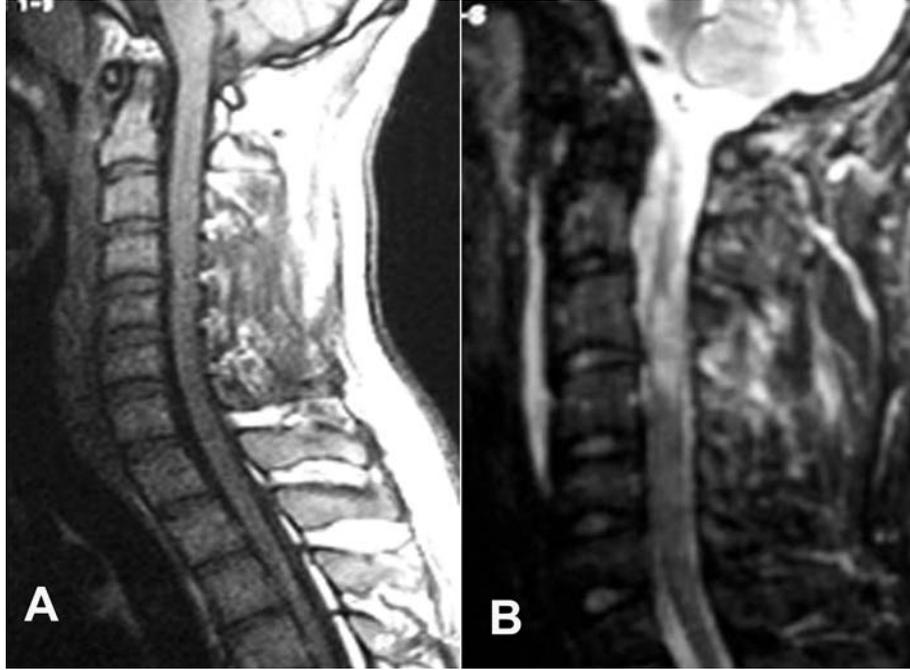


Figure 3. Cervical sagittal T2 (A) and T1 (B) weighted MR images. T2 weighted showing spinal cord edema and swelling at the level of C3-4.

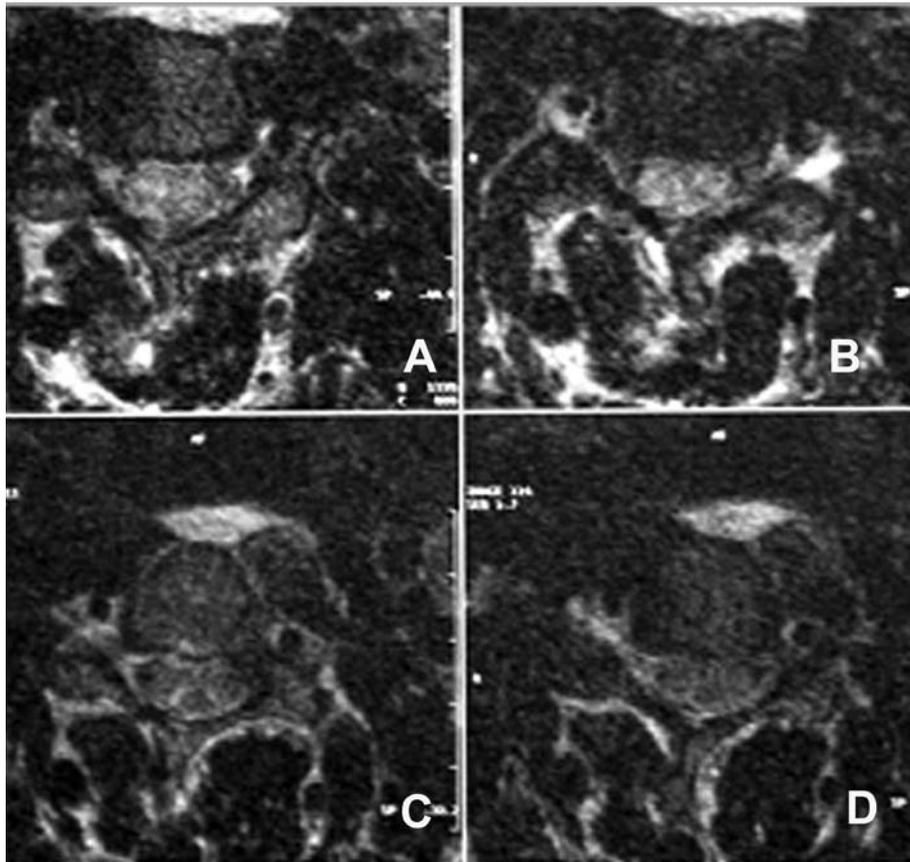


Figure 4. Axial MR images at the level of C3-4. There were no disc herniation, stenosis, and spondylotic changes.

ments, which lead to neural injury without bone and ligament injury^(3,9). The big size of children's heads in proportion to their bodies, immature cervical muscles and paravertebral ligaments might also cause segmental movements. C2-3, C3-4 levels make up maximum flexion points of children in the cervical spine. The flexibility of the spine is reduced with increasing age and skeletal maturation. As the maturation is completed, the maximum flexion point reaches the level of C5-6, as in the adults, at the average age of 8⁽¹⁶⁾. It was suggested that in the SCIWORA physiopathology, the vertebral artery would be congested between occiput and C1 during rotation and extension. But no evidence was found to show its primary role^(9,16,17). Today, none of the pathophysiologic mechanisms put forward for SCIWORA is proven^(3,16).

On the other hand, the elderly populations frequently have posterior vertebral spurs and borderline ligamentum flavum bulging, because of loss of disc height, and they are thus prone to develop central cord syndrome after a hyperextension injury, as it may happen after a trivial fall.

Patients with SCIWORA may present with immediate or delayed myelopathic symptoms, the latent period varying from 30 minutes to 4 days after injury⁽¹⁶⁾. The myelopathic findings ranged from mild transient symptoms to permanent neurological deficits. There may be complete or incomplete cord transection or Brown-Sequard's syndrome⁽⁵⁾. In diagnosing, radiological studies include CT and direct x-ray radiographs carried out in a dynamic and static plan. Traumatic findings and additional pathologies might not be detected in x-ray radiographs and CT, which might cause cord injury. In SCIWORA, MR monitoring has a role not only in diagnosing but also in evaluation of prognosis and diagnosing other pathologies⁽⁶⁾. Edema in spinal cord, contusion, and hemorrhage can be detected in MR monitoring. In SCIWORA, his-

tory, physical examination, dynamic and static plan x-ray radiographs and CT help diagnosis^(6,15,16). MR confirms, any existing cord injury.

SCIWORA in adults is not well documented. However, in some of the case presentations and series, it is seen that patients are diagnosed with SCIWORA without complete documentation.^(1,6,8) A literature review, of documented adult SCIWORA cases, additional pathologies such as disk herniation in the spinal canal, stenosis, and spondylosis were found in MR examinations^(1,8). These cases are not compatible with the diagnosis of SCIWORA^(1,8).

The demonstration of changes in the cord has also been useful in predicting recovery. The neurological outcome in patients with focal edema of the cord has been better than in the patient with overt hematoma or contusion of the cord as seen on MRI. Schaefer et al. reported that the focal edema was associated with motor recovery of 70 %⁽²⁰⁾.

In this report, a young-man presented with complete neurological deficits and contusion-edema of the cervical spinal cord on MRI after trauma, without any radiological and CT traumatic abnormalities. There was no recovery at the end of the follow-up. Although it is considered that pathophysiologic mechanisms in adult cases are likely to be different from those of the children, we believe that abnormal segmental movements during trauma and/or vascular damage which leads to spinal cord ischemia at a micro vascular level result in complete spinal cord injury.

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