

Case Report

A Rare Case of Adult Thoracic SCIWORA: Complete Cord Transection Without Vertebral Injury



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ABSTRACT

Background and Importance: Spinal cord injury without radiographic abnormality (SCIWORA) is predominantly reported in pediatric populations, especially involving the cervical spine. In adults, particularly in the thoracic region, such injuries are exceedingly rare due to the biomechanical rigidity of the thoracic vertebrae. This case report presents an adult patient with a complete spinal cord transection at the T7–T8 level in the absence of any vertebral fracture or dislocation.

Case Presentation: A 25-year-old male was admitted to the intensive care unit following a high-energy motor vehicle accident. Although the initial computed tomography (CT) of the thoracic spine showed no signs of vertebral injury, the patient developed complete paraplegia upon regaining consciousness. Magnetic resonance imaging (MRI) revealed a full-thickness transection of the spinal cord at the T7–T8 level. No surgical intervention was indicated due to the absence of compressive or unstable elements.

Conclusion: Adult thoracic SCIWORA is an exceptionally rare clinical entity. In cases of severe neurological deficit with negative radiographs and CT scans, a prompt MRI is crucial for diagnosis. This case highlights the need for refined classification systems that incorporate MRI findings and biomechanical assessments to characterize such presentations better and inform clinical management.

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Highlights

- Complete thoracic cord transection without fracture
- MRI showed full spinal cord transection at T7–T8 with no vertebral injury—an extremely rare adult SCIWORA case.
- MRI is essential despite normal CT/X-ray

Early MRI is critical for diagnosing unexplained neurological deficits when CT and radiographs are negative.

- Current SCIWORA classifications are insufficient

The case highlights the need for updated systems, including MRI findings and biomechanical stability in adults.

Plain Language Summary

This report describes a very rare spinal cord injury in an adult. A 25-year-old man had a serious car accident. Initially, scans (CT and X-ray) revealed no damage to his spine. Later on, doctors discovered that he could not move or feel his legs. An MRI scan revealed that his spinal cord was completely cut at the middle back level (T7–T8), even though his bones were not broken or dislocated. This type of injury, called spinal cord injury without radiographic abnormality (SCIWORA), typically occurs in children and is rarely seen in adults, especially not in the thoracic (mid-back) spine. Because his spine was stable and there was no pressure on the cord, surgery was not needed. This case shows that serious spinal cord injuries can happen without broken bones and that an MRI is very important when someone has weakness or paralysis after trauma. It also suggests that doctors may need new ways to classify these injuries, particularly in adults, to facilitate diagnosis and treatment.

1. Background and Importance

Spinal cord injury without radiographic abnormality (SCIWORA) was first introduced by Pang and Wilberger in 1982 to describe spinal cord injuries in pediatric patients whose radiographs and computed tomography (CT) scans showed no signs of vertebral fracture or dislocation [1]. The term has historically been associated with the pediatric population, particularly in relation to the cervical spine, due to the greater elasticity and flexibility of the immature spinal column [2].

With the advent of magnetic resonance imaging (MRI), our ability to detect intramedullary spinal cord damage has significantly improved, leading to the identification of SCIWORA-like presentations in adult patients as well [3]. However, in contrast to pediatric cases, adult cases of SCIWORA are rare and often debated due to the relative rigidity of the mature spinal column and reduced ligamentous laxity [4, 5].

The thoracic spine, being the most rigid and biomechanically stable segment of the vertebral column, is especially resistant to injury without associated osseous or

ligamentous disruption. Consequently, thoracic SCIWORA in adults is exceedingly uncommon, with only a limited number of reported cases in the literature [6–9].

Herein, we present a rare case of an adult patient who developed complete paraplegia following a high-energy motor vehicle accident, in the absence of any thoracic vertebral fracture or dislocation. MRI subsequently revealed a full-thickness transection of the spinal cord at the T7–T8 level. This case underscores the importance of maintaining a high index of suspicion for spinal cord injury in trauma patients with neurological deficits but unremarkable initial radiographs or CT scans. It also contributes to the limited body of literature documenting thoracic SCIWORA in skeletally mature individuals.

2. Case Presentation

A 25-year-old male was admitted to the emergency department after being involved in a high-energy motor vehicle accident. On arrival, he was unconscious and exhibited signs of polytrauma, including multiple contusions and suspected head injury (Figure 1). Endotracheal intubation was performed under sedation due to agitation and compromised airway protection.



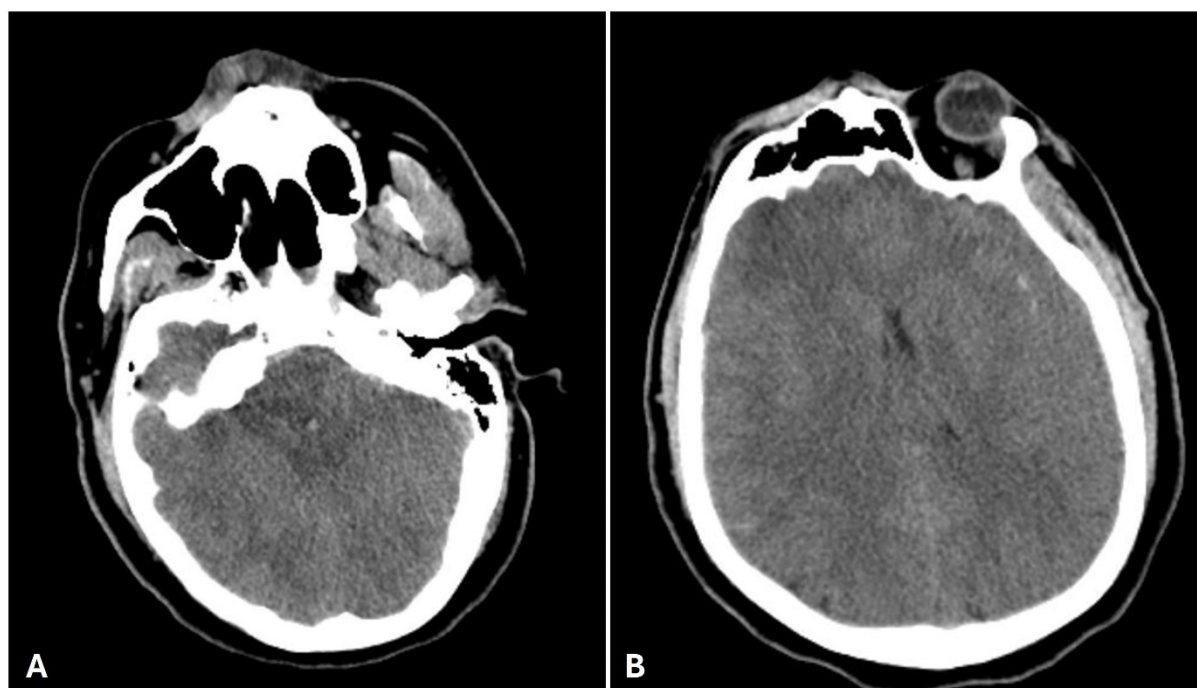


Figure 1. Axial non-contrast brain CT showing traumatic subarachnoid hemorrhage in the basal cisterns and convexities

Note: This intracranial pathology explains the patient's initial unconscious state and the need for delayed neurological examination, which later revealed complete paraplegia.

Initial brain computerized tomography CT revealed a traumatic subarachnoid hemorrhage. Thoracic CT showed right-sided rib fractures at the 7th and 8th levels, left-sided rib fractures at the second, fourth, and ninth levels, bilateral pleural effusion, and pulmonary contusions. However, no evidence of thoracic vertebral fracture, subluxation, or dislocation was observed. The patient was admitted to the intensive care unit and kept under sedation for 48 hours due to the severity of his cranial trauma.

Upon regaining consciousness one week later, neurological examination revealed a Glasgow Coma scale (GCS) score of 15, but complete motor paralysis of both lower extremities was noted. Deep tendon reflexes were absent in the legs, and anal sphincter tone was diminished. Sensory examination demonstrated a sharp sensory level at T7. There was no voluntary movement or proprioception below this level, consistent with complete paraplegia. The thoracic CT images were re-evaluated and again confirmed the absence of bony injury (Figure 2).

Radiological findings

A thoracic magnetic resonance imaging (MRI) scan was obtained to investigate the cause of the neurologic

deficit. T2-weighted sagittal and axial images revealed a complete transection of the spinal cord at the T7–T8 level (Figure 3). The cord was visibly disrupted, with cerebrospinal fluid (CSF) clearly delineating the gap between the proximal and distal stumps. No signs of vertebral body fracture, facet joint dislocation, or posterior element disruption were seen.

There were also no signs of epidural hematoma, ligamentous injury, or spinal instability. Importantly, the alignment of the vertebral column was preserved, and the intervertebral disc spaces were intact. These findings supported the diagnosis of a complete SCIWORA, in its rare thoracic adult form. Given the biomechanical stability of the spinal column and absence of compressive pathology, surgical intervention was not pursued, and the patient was managed conservatively.

3. Discussion

SCIWORA was originally conceptualized to describe spinal cord injury in pediatric patients who presented with neurologic deficits following trauma but lacked evidence of osseous injury on radiographs or CT scans [1]. This phenomenon is most frequently observed in children due to their flexible ligamentous structures and immature musculoskeletal system. In contrast,

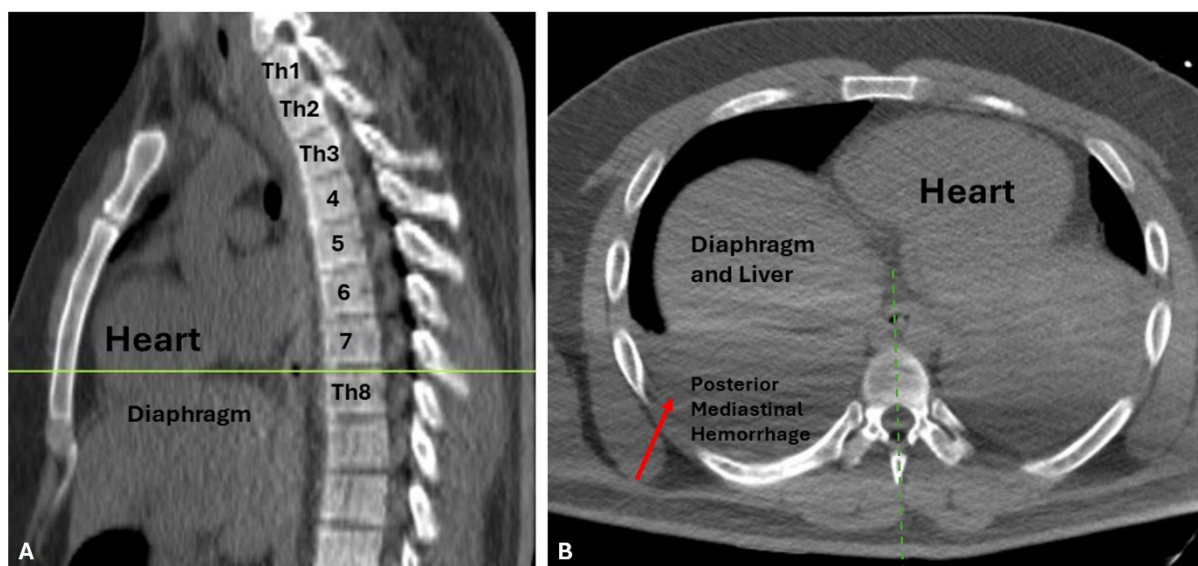


Figure 2. Sagittal and axial thoracic CT images demonstrating intact vertebral body alignment and morphology at the T7–T8 level, despite the presence of high-energy trauma

Note: Notably, retro-mediastinal hemorrhage is observed, suggesting significant transmitted force to the thoracic cavity.

adult SCIWORA is rare, particularly in the thoracic region, where the spine is anatomically more rigid and stabilized by the rib cage [4, 5].

The presented case illustrates an unusual form of adult thoracic SCIWORA, in which a complete transection of the spinal cord occurred without any radiological evidence of fracture, dislocation, or biomechanical instability. The rarity of such presentations is supported by existing literature: A review by Khatri et al. identified only a handful of thoracic SCIWORA cases in adults, most of which involved edema or signal change, rather than frank cord transection [6]. Cases of MRI-confirmed complete transection in the absence of vertebral injury are exceptionally uncommon [7–9].

Several injury mechanisms have been proposed for such presentations, including hyperflexion or hyperextension forces that cause distraction injuries to the cord without bone injury, vascular compromise leading to ischemia and secondary cord necrosis, and shearing forces transmitted through intact vertebral columns in high-energy trauma [10–13].

These rare cases highlight a potential gap in the current classification of spinal cord injuries. The term SCIWORA, though useful, fails to adequately capture the full range of presentations, especially in adults, where high-resolution MRI has demonstrated significant parenchymal injury despite normal radiographs and

CT imaging. Some authors have proposed alternate terminology, such as “SCIWOCTET” or “SCIWOBA,” to reflect this broader spectrum [14]. However, these terms remain inconsistently used and lack formal validation.

A review of previously published adult thoracic SCIWORA cases is summarized in Table 1. As demonstrated, complete spinal cord transection in this context is extremely rare, with only a few reported cases in the literature, underscoring the exceptional nature of our case.

Our case supports the need for a refined classification framework that recognizes the radiological-histopathological disconnect in adult thoracic injuries, accounts for MRI-only detectable injuries, differentiates between minor cord edema and complete transection, and includes a biomechanical assessment component.

Such a system may aid in prognostication, guide therapeutic decision-making, and standardize reporting in clinical and academic settings.

Delayed diagnosis and preventive strategies

In retrospect, this case raises the critical issue of diagnostic delay in spinal cord injuries without radiographic abnormalities. Although the patient was sedated due to severe cranial trauma, a comprehensive

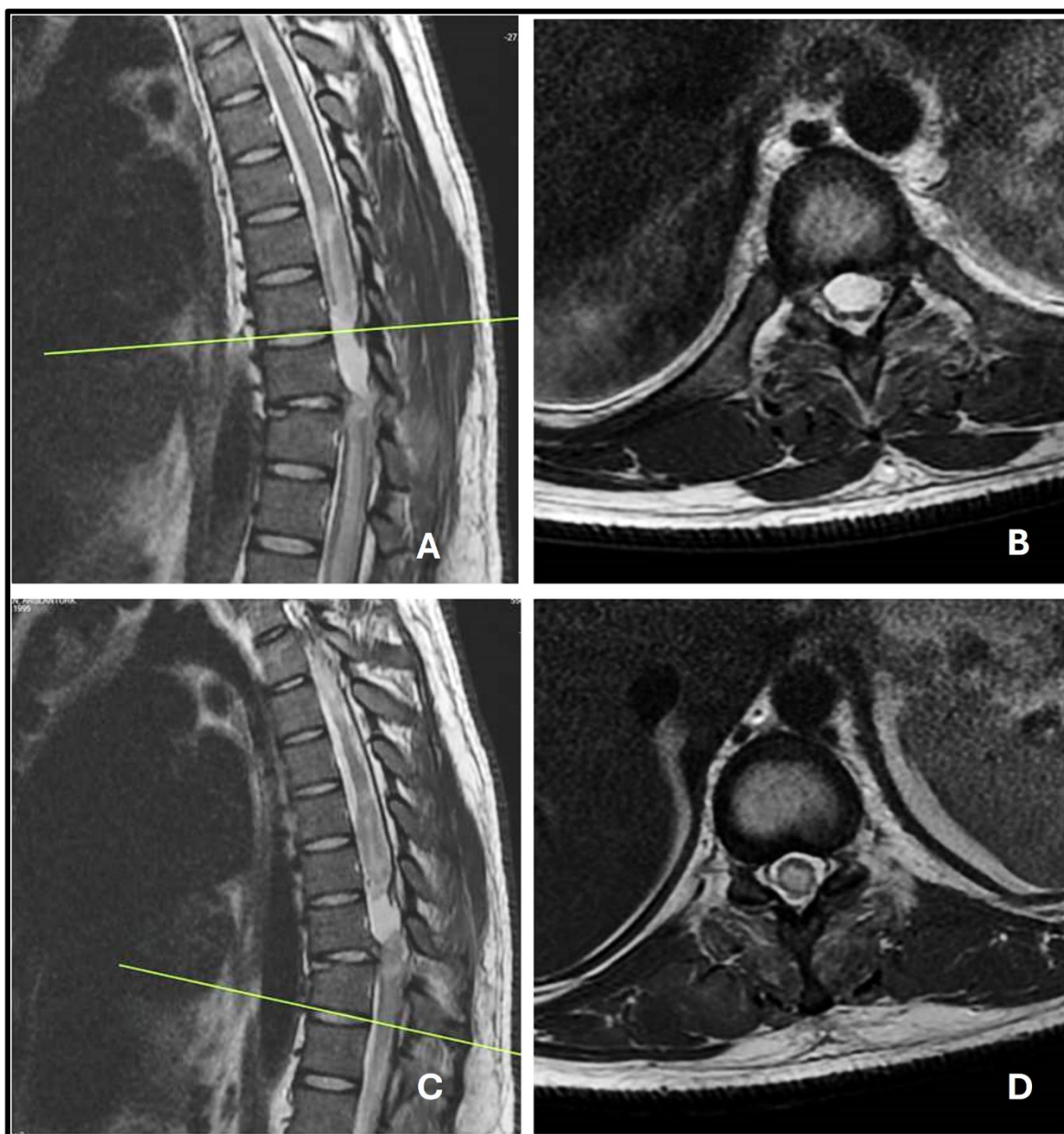


Figure 3. A and B) Axial T2-weighted MRi images clearly depicting a complete transection of the thoracic spinal cord at the T7–T8 level; C and D) the spinal cord viewed in axial section for comparison

Note: CSF accumulation is noted between the severed proximal and distal cord segments, with no evidence of adjacent vertebral fracture or dislocation.

spinal examination might have prompted earlier suspicion of spinal cord injury, especially in the presence of high-energy trauma and associated thoracic injuries such as bilateral rib fractures and pulmonary contusions. Early neurological assessment, including passive examination of deep tendon reflexes or sensory evaluation where feasible, could have triggered earlier imaging.

Similar diagnostic delays have been reported in the literature. In a case reported by Dubey et al., an adult patient developed paraplegia several hours after trauma, with the initial CT being normal and an MRI performed only after neurological deterioration [12]. Likewise, Hana et al. described a case of delayed-onset paraplegia in which MRI findings consistent with SCIWORA were only detected after a 24-hour lag, contributing to poorer clinical outcomes [18]. These reports, along with our

Table 1. Summary of Adult Thoracic SCIWORA Cases Reported in the Literature

Authors (y)	Clinical Outcome	MRI Findings	Injury Level	Mechanism of Injury	Sex	Age (y)
Koizumi et al. 2002 [9]	Paraplegia	Cord signal change	T5	Traffic accident	Female	19
Koizumi et al. 2002 [9]	Paraplegia	Cord signal change	T7	Traffic accident	Male	63
Van Buul et al. 2009 [5]	Paraparesis	Cord contusion	T4+T8	Motorcycle accident	Male	27
Zipfel et al. 2010 [8]	Paraplegia	Complete transection	T1+T2	Traffic accident	Male	48
Smith et al. 2012 [15]	Paresthesia	Cord edema	T12	Low-energy injury	Male	37
Park et al. 2012 [13]	Lower limb weakness	Cord edema	T8	Low-energy injury	Male	38
Lao et al. 2013 [7]	Paraplegia	Complete transection	C6–7 and T10–11	Traffic accident	Male	52
Huang et al. 2020 [16]	Paraplegia	Butterfly vertebra+SCI	T11–T12	Traffic accident	Male	42
Zhong et al. 2023 [17]	Right leg weakness	Cord stretching injury	T4	Traffic accident	Male	38
Present Case, 2025	Paraplegia	Complete transection	T8	Traffic accident	Male	25



Note: Only thoracic cases with MRI-confirmed findings and no CT-detected vertebral injury were included. This table highlights the rarity and variability in presentation among reported adult cases. Traffic and motorcycle accidents in this table are considered high-energy trauma mechanisms capable of producing spinal cord injury even in the absence of vertebral fractures or dislocations.

case, underscore the need for high suspicion in trauma patients with altered consciousness or distracting injuries.

To minimize diagnostic delay, current recommendations suggest that MRI should be performed in any trauma patient with unexplained neurological findings, particularly when CT and X-rays are unremarkable. This approach is supported by recent guidelines in spinal trauma care, which advocate for early MRI in cases of neurologic deficit despite normal radiographs [4, 13].

4. Conclusion

Thoracic SCIWORA in adults remains an exceptionally rare entity, particularly when involving complete cord transection without vertebral fracture or dislocation. This case underscores the critical importance of early MRI in patients presenting with severe neurological deficits and unremarkable initial radiographs or CT scans. The findings support the existence of a distinct subgroup of adult thoracic SCIWORA that current classification systems may not fully capture. There is a need to revisit and potentially refine the terminology and diagnostic criteria to incorporate MRI-based findings and biomechanical assessments, thereby improving recognition, communication, and management strategies in such complex cases.

Ethical Considerations

Compliance with ethical guidelines

This case report was conducted in accordance with institutional and international ethical standards. Informed consent was obtained from the patient for publication of all clinical information and accompanying images. Ethical approval was not required for a single case report under local regulations.

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Authors' contributions

Conceptualization and study design: Vaner Köksal and Cem Demirel; Data collection: Melih Van, and Fatih Tomakin; Data analysis and interpretation: Melih Van; Final approval: Vaner Köksal; Review & editing: Vaner Köksal and Recai Engin.

Conflict of interest

The authors declared no conflict of interest.



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