The Journal of Turkish Spinal Surgery
2009; 20 (3): 71-74

CASE REPORT / *OLGU SUNUMU*

THORACIC SPINAL CORD INJURY WITHOUT VERTEBRAL BODY FRACTURE OR MALALIGNMENT: A CASE REPORT AND REVIEW OF THE LITERATURE

VERTEBRAL CİSİM KIRIĞI VEYA YANLIŞ DİZİLİM OLMAKSIZIN ORTAYA ÇIKAN TORASİK SPİNAL KORD YARALANMASI: OLGU SUNUMU VE LİTERATÜRÜN GÖZDEN GEÇİRİLMESİ

Selin Tural EMON*, Deniz KONYA, Arzu GERCEK***, Serdar OZGEN******

SUMMARY:

A case of thoracic spinal cord injury without vertebral body fracture or malalignment has been reported. The patient was involved in an industrial compression accident. Spinal cord injury without bone lesion or any ligamentous injury is a rare condition in adut population. Evaluation of magnetic resonance images showed spinal cord contusion on T10-12 with no evidence of ligamentous damage. Similarly, no evidence of bone damage to the spine was found on the plain and computed tomography. In conclusion, it should be kept in mind that in trauma case, spinal cord injury may occur without any vertebral body fracture or malalignment.

Key Words: *Adult spine, spinal cord injury (SCI), spinal cord injury without radiographic abnormality (SCIWORA), thoracic spine.*

Level of Evidence: *Level IV, case report*

ÖZET:

Bu çalışmada, vertebral cisim kırığı veya dizilim bozukluğu olmaksızın torosik spinal kord yaralanması olan bir olgu sunulmuştur. Bu hasta, endüstriyel ezici bir kazaya maruz kalmıştır. Kemik lezyon veya ligamentöz yaralanma olmaksızın spinal kord yaralanması, erişkinlerde çok nadir bir durumdur. Manyetik rezonans görüntülerin incelenmesi T10-12 düzeyinde ligamentöz harabiyet olmaksızın spinal kord kontüzyonu olduğunu ortaya koymuştur. Benzer olarak, kompüterize tomografide omurgada kemik yapıda bir hasar olmadığı belirlenmiştir. Sonuç olarak, erişkin omurga travması olgularında vertebral cisim kırığı veya dizilim bozukluğu olmaksızın, spinal kord yaralanması olabileceği akılda tutulmalıdır.

Anahtar Kelimeler: *Erişkin omurga, spinal kord yaralanması (SCI), radyolojik bir anormallik olmaksızın görülen spinal kord yaralanması (SCIWORA).*

Kanıt Düzeyi: *Düzey IV, olgu sunumu.*

(*) MD. Department of Neurosurgery, Academic Hospital, Istanbul.
(**) MD, Department of Neurosurgery, Marmara University, School of Medicine, Istanbul.
(***) MD. Department of Anesthesiology, Marmara University, Institute of Neurological Sciences, Istanbul.
(****) MD, Department of Neurosurgery, Marmara University, School of Medicine, Istanbul

Corresponding Address: *Selin Tural Emon, MD. Nuhkuyusu Caddesi, No:88 34664 Uskudar Istanbul, Turkey*
Phone: *+90 (532) 525 38 99*
Fax: *+90 (216) 651 00 24*
e-mail: *turalselin@gmail.com*

INTRODUCTION:

Spinal cord injury without radiological abnormality (SCIWORA) is a syndrome of spinal cord trauma, describing post traumatic myelopathy without evidence of vertebral fracture or mal-alignment [1,2,6]. The injury is documented in children, probably due to increased elasticity of the pediatric spine. A few case with SCIWORA in adult patient is reported. Thoracic SCIWORA is also a rare condition, with few reported cases [3,4,6,7]. Because it is supported by the stiffness of the rib cage and chest wall musculature, the upper thoracic spine has greater stability than the cervical and lumbar regions, and thus its fracture or fracture dislocation is less frequent. This protective cage strengthens the spinal column and shields the spinal cord from all but the highest velocity forces. Injury in this region of the thoracic spine is frequently associated with significant neurological deficit [5]. It is not described clearly in adults with normal spinal canals although the elderly patients with osteoarthrotic spines and stenotic canal may suffer traumatic spinal cord damage without accompanying vertebral injury.

In this report, an adult case of thoracic spinal cord injury without compressive vertebral corpus fracture has been reported.

CASE REPORT:

A 35-year-old male patient was admitted to our hospital with the complaint of acute paraplegia. The history of the patient revealed that the body of the patient was compressed between two lumbers while working with a saw bench four hours ago. Neurologically complete motor and sensory deficit distal to the level T10 was noted immediately after the injury. There was no anal sphincter tone.

The plain radiographs and computed tomography (CT) scan showed fracture line on T6-T7 spinous process but no abnormality of the vertebral bodies. Chest CT scan showed multiple rib fractures on bilateral thoracic cage and bilaterally existence of hemothorax. Magnetic resonance imaging (MRI) showed multifocal hypo-/iso-intense lesions through the levels of 10th to12th thoracic (T) vertebrae on T1 weighted images and hyperintensity on T2 weighted images, suggesting cord contusion and edema (Figure-1).

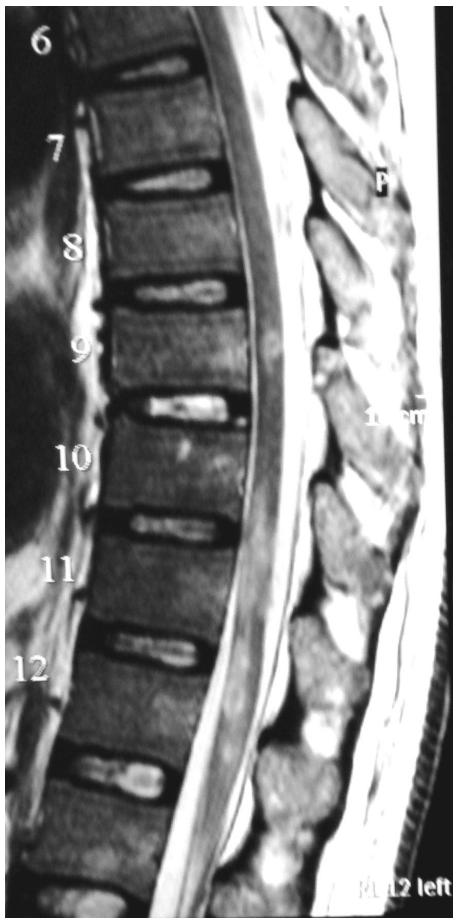

Figure-1. Magnetic resonance imaging, T2-weighted sagittal image of the thoracolumbar spine. High-intensity patchy area is seen in the cord between Thoracic10 and Thoracic12. Fracture lines on the spinous processes of T6 and T7 are also observed.

The patient was started on conservative treatment including administration of methyl prednisolone. A bolus dose of methyl prednisolone 30 mg/kg was followed by 23 hours of treatment with 5.4 mg/kg. (Prednol-L 250 mg ampule, Mustafa Nevzat, Turkey) and B complex vitamin (Neurogriseovit ampule containing vitamin B12 1 mg,

vitamin B1 100 mg, vitamin B6 100 mg, Deva, Turkey).

There was no vertebral column instability on dynamic flexion-extension films. After bed rest and medical treatment, the patient was transferred to the rehabilitation center. In the 6-month follow up, no clinical improvement or deterioration was observed.

DISCUSSION:

Tator et al [5] have reported that 15 % of all spinal cord injuries occur at the thoracic levels. The thoracic vertebrae between T1 to T10 are protected by the rib cage and the back and chest wall musculature. This protective cage of ribs and muscle strengthens the spinal column and shields the spinal cord from all but the highest velocity forces. Nonetheless, injury in this region of the thoracic spine is frequently associated with significant neurological deficit [5]. Although the thoracic spinal column is the most difficult to injure, the contained thoracic spinal cord is very susceptible to trauma, and when compared with other spinal regions, has the poorest prognosis for functional recovery [5]. Hirsh et al [3] first described thoracic spinal cord injury without spine fracture in an adult in 1993. Their case demonstrated that thoracic SCIWORA might occur in adults, perhaps suggesting that the thoracic spine may not be stable as is often taught [3].

We conducted a detailed literature review of the 5 cases of thoracic spinal cord injury without vertebral bony lesion that have been reported to date (Table-1). Four of these patients were male and one was female, and the age range was 19 to 63 years (median: 29 years). The trauma in 4 these patients were due to a motorcycle accident and in the other patient, industrial accident.

Table - 1. Clinical parameters and findings for the 5 previously reported cases of thoracic spinal cord injury without vertebral bony fracture

Author (publication)	No of Cases	Age (years), Sex	Type of Trauma	Plain Radigraphs, CT, MRI Findings of Vertebrae	Level of Spinal Cord Damage on MRI	Other System Findings	Way of Spinal Cord İnjury
Hirsh et al (1993)	1	20, male	Traffic accident (motorcycle)	Fractures of the transverse process of L1 through L4 vertebrae and damage of interspinous ligaments at the level of cord injury	Transection of the spinal cord at the T6-T7 level	Pneumothorax and retroperitoneal hematoma	Spinal hyperflexion with spinal cord distraction
Koizumi et al (2002)	2	19, female	Traffic accident (motorcycle)	Fracture dislocation of the costovertebral joints of the T4 and T5, fracture of the T4 spinous process	Spinal cord contusion at T5 level	Multiple rib fractures and hemothorax	For both of cases: Transient subluxation or displacement of thoracic vertebra
		63, male	Industry accident	Abnormal area posterior element between the T4 and T5	Spinal cord contusion at T4 and T5 levels	Amputation of both upper arms and multiple rib fractures and hemothorax	
Samsani et al (2003)	1	17, male	Traffic accident (motorcycle)	Fractures of the transverse process of L1 through L4 vertebrae and damage of interspinous ligaments at the level of cord injury	Spinal cord contusion at T10 and T11 levels	Fractures of pelvis, tibia, fibula and femur	Traction injury to the sciatic nerves
VanBuul et al (2008)	1	27, male	Traffic accident (motorcycle)	T4,T11,T12 and L1 superior end plate contusions	Spinal cord contusion at T3 and T5 levels, avulsion of the nerve root T4	Fractures of the 2nd to the 7th ribs and lung contusion, fracture of scapula and femur	Longitudinal traction of the spinal cord, sciatic nerve extention
Present study (2009)	1	35, male	Industry accident	Fracture of the T6 and T7 spinous process	Spinal cord contusion at T10 and T12 levels	Multiple rib fractures and hemothorax	Transient subluxation and longitudinal traction of the spinal cord

All of these cases had fractures on the transverse process or spinous process or corpus end plate contusions. They also had other serious systemic problems (Hemothorax, rib fractures, femur fractures) related to the severity of their trauma. Parallel to these cases; in our case CT scan and MRI showed fracture line on the spinous processes of T6 and T7. However, the contours of the vertebral bodies and discs were normal, and no fragment impingement was noted on the thoracic cord in the spinal canal. Our patient had T10-12 cord contusion and edema without fracture, which contradicts with the high incidence of the thoracolumbar junction fracture (T11-L1). There was no preexisting spinal canal stenosis (ossifications or disc protrusion).

Plain radiographs and computed tomography (CT) allow definition of the bony lesions. Dynamic flexion-extension films are important to evaluate instability. Magnetic resonance imaging can show ligamentous injuries in the spinal cord. The combination of plain radiographs, CT, and MRI allows definition of the bony and ligamentous injuries. The information from these studies facilitates classification of the injury, identification of the unstable injuries, and selection of the proper instrumentation to stabilize the unstable spinal column elements adequately [(5)].

After Hirsh et al [(3)], Koizumi et al [(4)] reported 2 cases. They concluded that transient subluxation or displacement might have caused the upper thoracic spinal cord injury after the support of the rib cages was temporarily lost upon application of excessive force, traction, and stretching of the spinal cord. In addition, midthoracic region has limited blood supply to the spinal cord. Thus, trauma can cause vascular spinal cord infarctions [(4)]. Samsani et al [(6)] concluded that thoracic SCIWORA manifested as a result of traction injury to the sciatic nerves caused by bilateral violent lower limb injuries. In our case, the spinal cord injury might have been due to the transient subluxation and longitudinal traction of the spinal cord.

In conclusion, it should be kept in mind that in trauma case, spinal cord injury may occur without any vertebral body fracture or mal-alignment.

REFERENCES:

1. Bhatoe HS. Cervical spinal cord injury without radiological abnormality in adults. *Neurol India* 2002; 48: 243-248.
2. Gupta SK, Rajeev K, Khosla VK, Sharma BS, Paramjit , Mathuriya SN, Pathak A, Tewari MK, Kumar A. Spinal cord injury without radiographic abnormality in adults. *Spinal Cord* 1999; 37: 726-729.
3. Hirsh LF, Duarte L, Wolfson EH. Thoracic spinal cord injury without spine fracture in an adult: case report and literature review. *Surg Neurol* 1993; 40: 35-38.
4. Koizumi M, Ueda Y, Iida J, Matsuyama E, Yoshikawa T, Takakura Y, Hirai T, Murakami J. Upper thoracic spinal cord injury without vertebral bony lesion: a report of two cases. *Spine* 2002; 1: E467-E470.
5. Parley W, Madsen III, Eismont FJ, Green BA. Diagnosis and management of thoracic spine In: Winn HR, ed. *Youmans Neurological Surgery,* Vol. 4, Fifth edition, New York, Saunders, 2004, pp: 4951-4986.
6. Samsani SR, Calthorpe D, Geutjens G. Thoracic spinal cord injury without radiographic abnormality in a skeletally mature patient: a case report. *Spine* 2003; 15: E78-E80.
7. Van Buul G, Oner FC. Thoracic spinal cord injury without radiographic abnormality in an adult patient. *Spine J* DOI: 10.1016/j. spinee .2008.03.003.