



### Double-Level Incomplete Spinal Cord Injuries: A Case Report

#### Çift Seviyeli Tamamlanmamış Omurilik Yaralanmaları: Olgu Sunumu

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*Cukurova Medical Journal 2014;39(2): 392-398.*

#### ABSTRACT

Brown-Séquard Syndrome is a type of Incomplete Spinal Cord Injury characterized by a relatively greater ipsilateral loss of proprioception and motor function, with contralateral loss of pain and temperature sensations. The residual deficits in balance produced by such injury may render a person liable to fall that may result in vertebral fracture and another injury to the spinal cord. We present here a case who initially had Brown-Séquard Syndrome due to penetrating knife injury to the neck and later on developed Cauda Equina Syndrome (another Incomplete Spinal Cord Injury) due to fractured LV1 following a fall. The fracture was fixed through Pedicle Screws and the patient underwent effective rehabilitation to gain maximum achievable independence in functional activities.

**Key Words:** Double-Level, Incomplete Spinal Cord Injury, Cauda Equina Syndrome, Brown-Sequard Syndrome, Rehabilitation, Pakistan

#### ÖZET

Brown-Sequard Sendromu; ısıya ve ağrıya duyarlılığın kontralateral kaybının yanı sıra motor işlevinin ve propriyosepsiyonun yüksek oranda ipsilateral kaybı ile karakterize edilen tamamlanmamış omurilik yaralanmalarının bir tipidir. Yaralanma vakaları sonucunda ortaya çıkan dengedeki hasarlar bireyi omur kırıklıklarına veya başka omurilik yaralanmalarına neden olabilecek düşmelere meyilli hale getirebilir. Bu vaka rapor çalışmamızda önce keskin bir bıçakla boyuna hasar alması ile "Brown-Sequard Sendromu" oluşmuş daha sonra ise bu sendromun neden olduğu düşme sonucu LV1 kırığının meydana gelmesinden dolayı bir başka tamamlanmamış omurilik yaralanması ile "Cauda Equina Sendromu" oluşmuş bireyi sunmaktayız. Kırık, pedikül vida ile tespit edildi ve hastaya işlevsel aktiviteleri tek başına yapabilecek maksimum kazancı sağlamak için rehabilitasyon programı uygulandı.

**Anahtar Kelimeler:** Çift Seviye, Tamamlanmamış Omurilik Yaralanması, Cauda Equina Sendromu, Brown-Sequard Sendromu, Rehabilitasyon, Pakistan.

#### INTRODUCTION

Spinal Cord Injury (SCI) may be categorized as Complete or Incomplete. Preservation of any motor or sensory function below the neurological level denotes an incomplete presentation of SCI<sup>1</sup>. Brown-Séquard Syndrome (BSS) and Cauda Equina Syndrome (CES) are two types of Incomplete SCI. BSS is described by a relatively

greater ipsilateral loss of proprioception and motor function, with contralateral loss of pain and temperature sensations<sup>1</sup>. CES is characterized by an areflexic bowel and/or bladder, with variable motor and sensory loss in the lower limbs<sup>1</sup>. Double-level Complete SCI has been reported previously in literature<sup>2,3</sup>. Here, we present a rare

case who developed Double-level Incomplete SCI syndromes.

### CASE

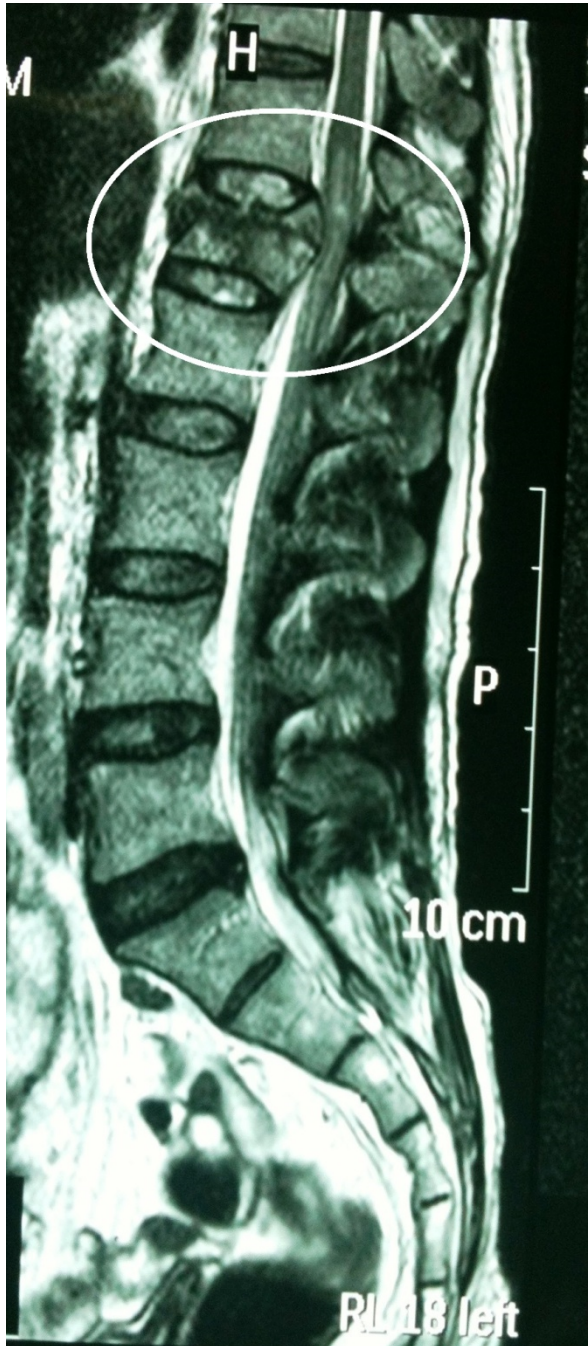
A 50 year old male shepherd presented with three week history of fall from a ridge resulting in sudden onset severe pain in lower back, weakness in legs and incontinence for bowel and bladder. He was taken to a tertiary care hospital after a lapse of eight hours where he was evaluated by spinal surgeon. He graded his pain 9/10 on Visual Analogue Scale (VAS). The Magnetic Resonance Imaging (MRI) of lumbar spine (Figure-1) revealed Burst Fracture of LV1 causing compression of adjacent nerve roots. The fracture was fixed surgically by Pedicle Screw placement in vertebrae from TV11 to LV3. (Figure-2) Two weeks following operation, he was transferred to our institute for rehabilitation.

Detailed inquiry at presentation revealed that he had a penetrating injury to the neck twenty years back in an assault with a knife that had resulted in persistent weakness of left half of his body and numbness of right half. He had been diagnosed simply as a case of hemiparesis and had progressively improved over time to independent ambulation with a cane. On examination, the patient was vitally stable and his pain had reduced to 4/10 on VAS. His Higher Mental Functions and Cranial Nerves were intact. Motor examination revealed 5/5 power in key muscle groups of right arm and 4/5 in left arm according to the Medical Research Council (MRC) Scale<sup>4</sup>. In lower limbs, the power was 4/5 in Iliopsoas and Quadriceps on left and 5/5 on right side. Ankle Dorsiflexors, ankle Plantarflexors, Gluteus Medius, Gluteus Maximus and Hamstrings had a power of 3/5 on both sides. Deep tendon reflexes of Biceps, Brachioradialis and Triceps were brisk on left and normal on right side. Knee

jerks were normal while ankle jerks were absent bilaterally. Babinski was negative bilaterally. The muscle tone was normal in upper limbs and reduced in lower limbs. Pinprick, touch and temperature sensations were impaired below T1 dermatome on left side while proprioception and vibration were impaired in right leg. Perianal sensations, voluntary anal contraction and Bulbocavernosus reflex were absent. Rest of the systemic examination was unremarkable.

Magnetic Resonance Imaging of the cervical spine revealed multiple disc protrusions at CV3/CV4, CV4/CV5 and CV5/CV6 levels causing compression on exiting nerve roots bilaterally. (Figure-3) Nerve conduction studies and electromyography of all limbs showed Polyradiculopathy L5→S4 bilaterally. Urodynamics Study indicated Low Compliance Acontractile Detrusor. Dual Energy X-Ray Absorptiometry Scan showed a T-Score of -2.1. Routine lab investigations were normal. Based on the above findings and investigations the patient was labelled as a case of CES alongside BSS. His functional evaluation computed a Functional Independence Measure (FIM)[5] score of 64/126.

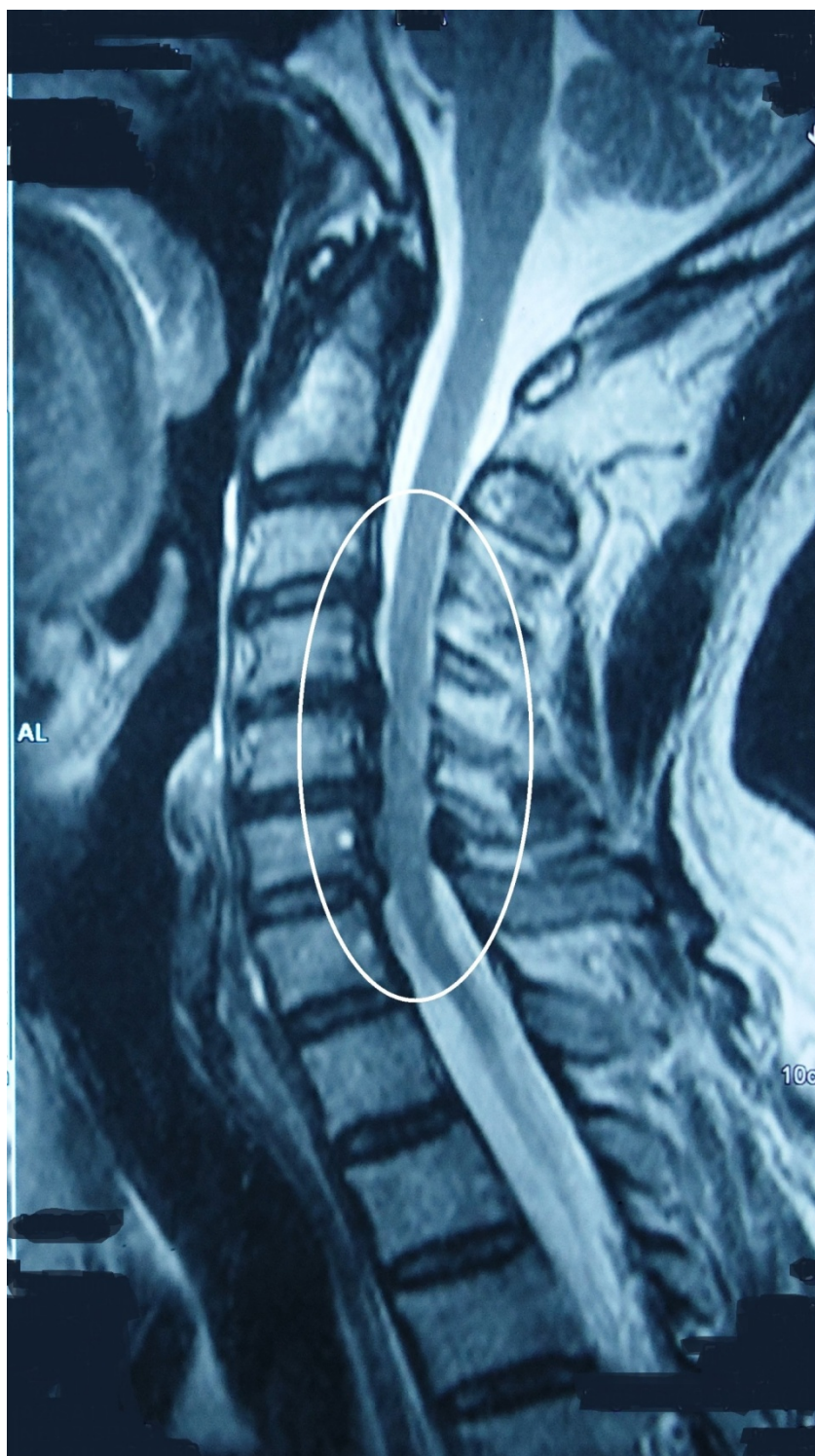
He underwent a month of indoor rehabilitation encompassing patient and family education and counselling, Transcutaneous Electrical Nerve Stimulation, physiological standing, range of motion and strengthening exercises, training in bowel and bladder management and Activities of Daily Living and psychological evaluation and intervention. He was also given oral Pregabalin and Paracetamol as analgesics, Vitamin B12 as neuroprotective agent and Calcium plus Vitamin D supplementation for low bone mass. Over a month, his pain improved to 2/10 on VAS and FIM Score improved to 110/126. The muscle strength improved by one grade in ankle dorsiflexors bilaterally.



**Figure-1.** Sagittal Film of MRI Scan of Thoracolumbar Spine showing Burst Fracture of LV<sub>1</sub> causing compression of adjacent nerve roots



**Figure-2.** AP and Lateral Films of X-Ray of Lumbar Spine showing Pedicle Screw placement in vertebrae from TV<sub>11</sub> to LV<sub>3</sub>



**Figure-3.** Sagittal film of MRI scan of Cervical Spine showing multiple disc protrusions at CV3/CV4, CV4/CV5 and CV5/CV6 levels causing compression on exiting nerve roots bilaterally.

## DISCUSSION

Cord damage may be missed clinically due to circumstances surrounding the accident. Absence of any serious neurological deficit initially, head injury, multiple injuries, radio-graphic or radio-diagnostic errors and failure to appreciate the mechanism of injury also contribute to missed spinal injuries<sup>6</sup>. Ohry'O reported two cases of SCI in whom the cause of paralysis remained uncertain for years<sup>7</sup>. Our case was not labeled SCI or BSS at the time of initial injury probably due to unavailability of MRI or lack of clinical expertise in spinal cord injury in the hospital to which he reported.

Patients with BSS usually fail to achieve normal gait pattern and adequate balance in challenging terrain. Accordingly, they are vulnerable to fall which may result in vertebral fractures and SCI that may be complete or incomplete.

CES is defined clinically by one or more of the following features: (1) bladder and/or bowel dysfunction, (2) reduced sensation in the saddle area (3) sexual dysfunction, with motor/sensory loss or reflex changes in the lower limbs<sup>8</sup>. Causes of CES include disc herniation in the lumbar region (commonest), trauma, spinal stenosis, tumors, infections, vascular disorders and iatrogenic injury<sup>9</sup>. Our case developed CES over and above BSS due to vertebral fracture that caused nerve root compression.

The treatment of CES is early surgery<sup>9</sup>. However, even after most efficient surgery, the patients may be left with incontinent sphincter and lower limb deficits leading to disability and dependency. Therefore, the best option for a patient after surgery is to seek best medical rehabilitation<sup>10</sup>. Our case had a remarkable improvement in pain after surgery, yet he was left with sphincter problems, distal muscle weakness in legs and functional

dependence. After rehabilitation, his pain improved, he became independent in bowel and

bladder management and mobility and improved his FIM score.

## CONCLUSION:

Failure in diagnosing SCI is avoidable by careful clinical evaluation. Anyone clinically suspected may be treated as potential case of SCI. Patients with physical disability due to SCI are liable to fall resulting in SCI with or without vertebral fracture. Rehabilitation must follow surgery to achieve improvement in motor control, coordination, bowel and bladder management, mobility and functional scores.

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geliş tarihi/received :28.09.2013  
kabul tarihi/accepted:04.11.2013