



## **Rehabilitation of a Traumatic Spinal Cord Injury Caused by Tourette's Syndrome: A Case Report**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author CDS wrote the draft of the manuscript, designed the figures, and managed literature searches. Author EB contributed to the correction of the draft. Author AIG provided subject matter and editorial expertise, and supervised the work. All authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/IJMPCR/2015/19245

#### Editor(s):

(1) Nurhan Cucer, Medical Biology Department, Faculty of Medicine, Erciyes University, Turkey.

#### Reviewers:

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(4) Amal Hassan, Atomic Energy Authority, Egypt.

Complete Peer review History: <http://sciencedomain.org/review-history/10626>

**Case Study**

**Received 31<sup>st</sup> May 2015**  
**Accepted 15<sup>th</sup> July 2015**  
**Published 23<sup>rd</sup> August 2015**

### **ABSTRACT**

**Aim:** This report illustrates how a complex movement disorder can lead to debilitating injury, how a post-acute rehabilitation course can improve functional outcomes in this injury, and how to prevent future events from occurring.

**Case Presentation:** This report describes the case of a 23 year-old female with a diagnosis of Tourette's syndrome and severe cervical spine motor tics. Following one of her tics, she experienced sudden left sided weakness and numbness. Following surgical decompression for cervical stenosis, the patient was transferred to an acute rehabilitation facility where she was able to make significant functional gains to reduce caregiver burden at discharge.

**Discussion:** Severe motor tics associated with Tourette's syndrome are a rare cause of cervical myelopathy. Additionally, the rehabilitation setting may be an opportune place to implement therapeutic interventions (pharmacological, behavioral) to prevent these types of events.

**Conclusion:** We report a case of a successful outcome following a rehabilitation course of an individual with cervical myelopathy caused by Tourette's syndrome.

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*Keywords: Cervical myelopathy; Tourette's syndrome.*

**ABBREVIATIONS**

*Spinal Cord Injury (SCI); Tourette's syndrome (TS).*

**1. INTRODUCTION**

There are various possible etiologies of spinal cord injury (SCI); however, Tourette's syndrome (TS) is rare cause. TS is a neurobehavioral disorder characterized by brief, intermittent motor movements or vocalizations (i.e., 'tics') that are often uncontrollable and frequently involve jerking or twitching [1]. When motor tics are localized to the head and neck and of a violent, repetitive nature, there is potential for cervical damage. The exact mechanism by which TS potentiates spinal injury remains unclear; however, one theory is that recurrent forceful neck motion (e.g., flexion, twisting, extension) causes traumatic stretching and persistent compression of the spinal cord, creating inflammation and decreased perfusion with resultant ischemia [2]. Additional reports have demonstrated spinal cord dysfunction and compressive myelopathy in TS as a result of cervical disc herniation [3]. Here, we present the case of a young woman who suffered from TS with frequent involuntary neck jerking tics and subsequent cervical cord compromise, who improved following a post-acute rehabilitation course which included pharmacological management of her movement disorder.

**2. CASE PRESENTATION**

The patient is a 23 year-old female with a longstanding history of Tourette's Syndrome and 'neck snapping' tics, who initially presented to the emergency department from a local movement disorder clinic due to concern for myelopathy. The patient complained of neck pain, left-sided weakness with associated numbness and urinary incontinence for one week prior to admission. Physical examination revealed left-sided hyperreflexia, sensory deficits, and focal weakness (grip strength, wrist extension). Further investigation, via MRI imaging of the brain and cervical spine, demonstrated multilevel disc-osteophyte complexes with resultant 8 mm narrowing of the spinal canal at C4-C5 and an abnormal T2 hyperintense cord signal at the C4 vertebral level (Fig. 1A & B).

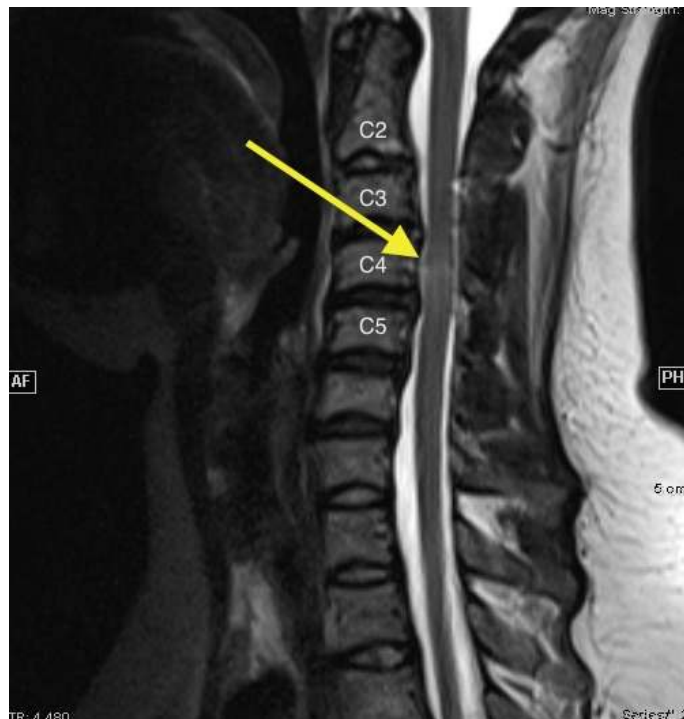
Given the patient's clinical picture coupled with her radiologic findings, it was suspected that she

had developed a spinal cord contusion/compression secondary to tic-induced trauma. The patient was then admitted to the inpatient neurology service for acute management. Within 24 hours of presentation to the emergency department, the patient underwent C3 to C6 cervical laminectomy. Her neurologic exam remained unchanged until postoperative day two, when her grip strength and wrist extensors improved from 2/5 to 4-/5 on manual muscle testing. On hospital day four, the patient was transferred to the acute rehabilitation facility in an effort to further improve strength, functionality, and independence.

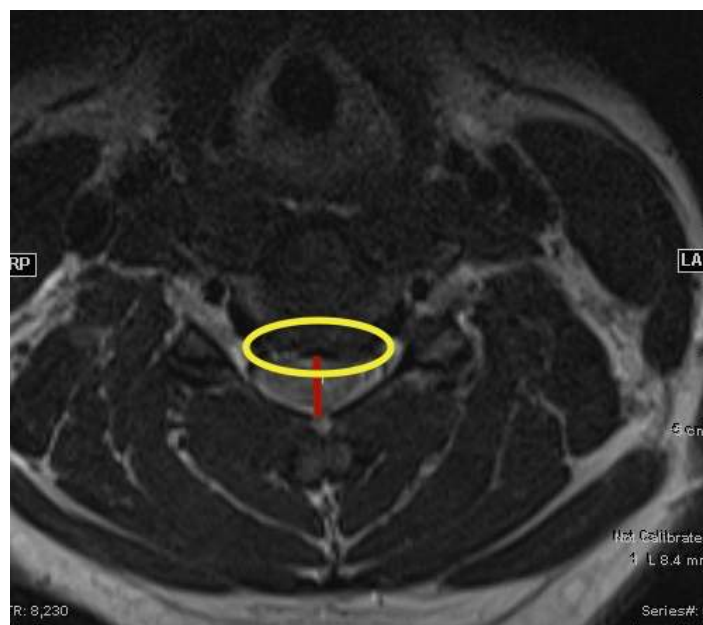
**Table 1. FIM scores on arrival and at discharge**

<b>FIM scores on admission:</b>	<b>FIM scores at discharge:</b>
Grooming: moderate assistance	Grooming: set-up supervision
Bathing: max assistance	Bathing: min assistance
Upper body dressing: max assistance	Upper body dressing: min assistance
Lower body dressing: max assistance	Lower body dressing: min assistance
Toileting: moderate assistance	Toileting: min assistance
Transfers: minimal assistance	Transfers: contact guard assistance
Locomotion: walk; 200 feet with rolling walker and contact guard assistance	Locomotion: walk; 400 feet with rolling walker and contact guard assistance

The patient was previously independent with activities of daily living (ADLs), but had regressed to requiring moderate-to-maximum assistance because of her injury. During her rehabilitation course she received pharmacological optimization, which included 1<sup>st</sup> and 2<sup>nd</sup> generation antipsychotics, behavioral modification and comprehensive therapy services. These interventions enabled her to make significant gains in her functional independence measures (FIM) (Table 1) above; allowing her to be discharged home with family on rehabilitation hospital day five with home health occupational and physical therapy.



**Fig. 1A.** MRI of the cervical spine in sagittal view (T2 weighted), depicting multilevel degenerative disc disease with the yellow arrow depicting the hyperintense signal at the C4 vertebral level and spinal canal stenosis of 8 millimeters noted from C3-C5.



**Fig. 1B.** MRI axial cut of the C4 vertebral level, with the yellow circle illustrating the disc-osteophyte complex and resultant narrowing of the spinal canal.

### 3. DISCUSSION

To our knowledge, this is the first report detailing the rehabilitation course of a patient with a cervical myelopathy caused by TS-associated motor tics. Although TS is a rare etiology for SCI, this report should heighten physician awareness of the possibility of SCI in patients with Tourette's syndrome who present with signs and symptoms of neurologic impairment consistent with this type of injury, especially if there are contributors such as osteophyte complexes narrowing the spinal canal [2].

This patient's postulated mechanism of tic-induced SCI was forceful hyperflexion-extension motions resulting in cord compromise, consistent with other reports [2-4]. Focal spinal canal narrowing has also been described in other cases of TS-induced myelopathy, and is conjectured to result from tic-caused spondylosis [4].

The second unique aspect of this case is the functional gains achieved with acute inpatient rehabilitation. There have been a handful of case reports describing surgical interventions for this syndrome [4]; however, none, to the authors' knowledge, have included a post-acute rehabilitation course, which in this case was characterized by the improvement in FIM scores. This impact should not be overlooked, as the improvement in FIM scores correlates with reduction in disability and assistance required to perform activities of daily living.

This report also highlights the importance of preventing further damage by optimizing the management of the movement disorder, and the rehabilitation setting may be a unique opportunity to intervene. The first line of treatment for TS is behavioral modification, and if this is not effective, the next step is to consider pharmacological treatment [1]. Dopamine-receptor blockers are typically the pharmacologic agent of choice (e.g., haloperidol, pimozide, ziprasidone) [5], although evidence supporting their use is anecdotal. Successful treatment with botulinum toxin has been reported for treatment-refractory TS tics, although controlled studies are lacking [6-7]. Another emerging technique, for the treatment of extremely resistant TS, is deep brain stimulation [8]; however, practitioners may be hesitant to recommend this procedure given the risk of bleeding, blurred vision and decreased energy [9].

### 4. CONCLUSION

This case report describes the presentation and inpatient rehabilitation course of an individual with cervical myelopathy caused by a movement disorder. This description does have limitations given it is an observational report; however, it characterizes the potential benefit of acute rehabilitation for such patients, and highlights the importance of preventive management in Tourette's syndrome.

### CONSENT

Consent was obtained from the patient prior to manuscript submission.

### ETHICAL APPROVAL

It is not applicable.

### ACKNOWLEDGMENT

The authors thank Regina Bell for her essential role in administrative support, and the Emory Department of Rehabilitation Medicine for funding this work.

### COMPETING INTEREST

The authors of this manuscript have declared no competing interest.

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