



## Case Report

# Traumatic cervical spine injury due to pole dance accident: A potentially catastrophic unreported injury with a happy ending. Case report and literature review

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## ABSTRACT

**Background:** Pole dancing is a sport that has become very popular. However, there is scarce literature on injuries associated with this sport. Here, we present a 23-year-old female who sustained a traumatic C4-C5 vertex cervical spine injury caused by a fall of 1 m while practicing pole dancing in an inverted position, requiring a 360 decompression/fusion.

**Case Description:** A 23-year-old female sustained a 1 m fall in an inverted position while pole dancing resulting in a direct axial impact to the head. She developed the rapid onset of quadriparesis that was attributed to the emergent CT/MR-documented cervical flexion-disruptive luxofracture (AOSpine C4-C5 fracture: C, F4 unilateral, N3, M2). Four hours post injury, she underwent a C4-C5 anterior cervical discectomy and fusion. Four days later, a posterior fusion was performed to add to the stabilization. Six years later, the patient remains neurologically intact.

**Conclusion:** Pole dance is an emerging sport which carries a risk of cervical spine injury.

**Keywords:** Cervical, Injury, Spine, Pole dance, Trauma

## INTRODUCTION

Pole dancing is an emerging sport that carries a risk of significant cervical spine trauma due to falls. This particularly applies when performing maneuvers in an inverted position such as hanging from a 40 to 50 mm diameter metal tube anchored to the floor and ceiling (usually over a 2.2 m height).<sup>[4-6]</sup> Here, we present a 23-year-old female who sustained a traumatic cervical spine injury resulting in a progressive quadriparesis after a pole-dancing fall.

## CASE DESCRIPTION

A 23-year-old female sustained a fall while pole dancing in an inverted position 1 m off the floor. This resulted in a direct axial impact on the vertex of the head that precipitated the onset of an acute quadriparesis (Motor Index Score [MIS] of 64/100, with a C5 motor and T2 sensory level). The injury was originally classified as an American Spinal Injury Association Impairment Score D,<sup>[1]</sup> but later reclassified to a C due to motor deterioration (MIS 41/100). Acute spinal cord

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**Figure 1:** C4-C5 flexion/distraction with anterior C4-C5 disc extrusion, bilaterally jumped facets, and posterior ligamentous disruption contributing to a highly unstable cervical spine.

injury (SCI) management was initiated, including NASCIS 2 methylprednisolone protocol.<sup>[3]</sup>

### Radiographic studies

Brain and spine CT/MR studies documented a C4-C5 flexion/distraction injury, an acute anterior disc extrusion with superior migration, complete bilateral jumped facet joints, and complete disruption of the posterior ligamentous complex [Figure 1]. The MR also demonstrated a T2 hyperintense signal within the cord at the C4-C5 level, consistent with a SCI (AOSpine classification C4-C5 fracture: C, F4 unilateral, N3, M2.) [Figure 2].

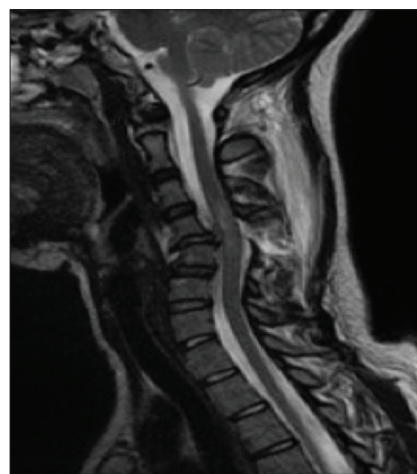
### Surgery

Preoperatively, cervical traction was applied under anesthesia/fluoroscopic control confirming marked instability; 8.8 pounds of traction resulted in reduction of the C4-C5 listhesis/dislocation, but had to be reduced to 6 pounds with mild neck extension to preserve the achieved reduction. A C4-C5 anterior discectomy was performed utilizing a PEEK cage and plate fusion; the surgery was completed within 7 hours after the accident. A secondary posterior C4-C5 lateral mass screw/rod fusion was performed to address the posteriorly disrupted ligamentous complex [Figure 3]. The patient presented progressive neurological recovery. Six months postoperatively, the MR showed residual C4-C5 myelomalacia but adequate cord decompression, while clinically she had regained full motor function with only mild residual dysesthesias in the fingers. Six-years later, she was clinically normal [Figure 4].

## DISCUSSION

### Literature review

Pole dancing is an increasingly popular sport,<sup>[5,6]</sup> but it poses the risk of cervical injury and other spine-related trauma after

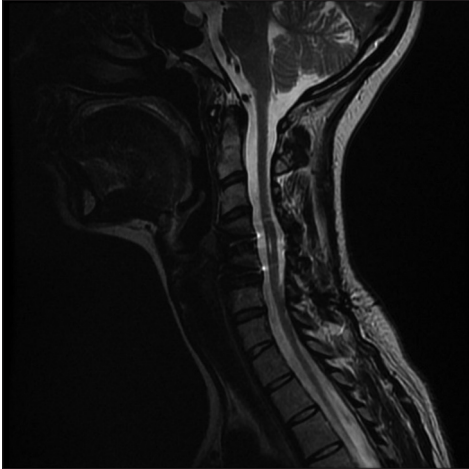


**Figure 2:** T2 Sagittal MRI confirming C4-C5 anterior/superior disc extrusion and a hyperintense signal within the spinal cord.



**Figure 3:** X-ray confirming 360° reduction and circumferential stabilization at the C4-C5 level.

falls/maneuvers sustained while in inverted position.<sup>[4]</sup> There is scarce literature available regarding traumatic injuries due to pole dance and similar disciplines [Table 1] and, to the best



**Figure 4:** T2 Sagittal MRI at 6-year follow-up confirming a stable C4-C5 fusion with only residual intramedullary myelomalacia secondary to the original spinal cord injury.

**Table 1:** Reports of pole dancing and acrobatic spine trauma.

Reference	Patient # - Activity	Type of Injury	Outcomes
Shrier <i>et al.</i> 2009 <sup>[7]</sup>	1376 - Cirque du Soleil acrobats	18 336 show or training related injuries	1.4 craniocervical injuries/1.000 performances 2.2 upper extremity injuries/1000 performances
Wanke <i>et al.</i> 2012 <sup>[8]</sup>	169 - circus school students	Cervical spine injuries	15.1% rate of cervical spine injuries
Bazan <i>et al.</i> 2020 <sup>[2]</sup>	6 - aerial silk acrobatics	Thoracic/thoracolumbar spine fractures	Injury pattern is multifactorial
Dittrich <i>et al.</i> 2020 <sup>[4]</sup>	4 - pole dance	Clavicle fracture, L2-L4 transverse process fracture, cranial contusion, and ankle sprain	Rigorous training and use of safety equipment is needed to prevent these injuries

of our knowledge, this is the first report of a traumatic cervical SCI after a pole dance-related accident. Wanke *et al.* in 2012 reported a rate of 15.1% of cervical spine injuries among 169 circus school students.<sup>[8]</sup> In 2020, Bazan *et al.* presented six patients with thoracic/thoracolumbar spine fractures due to falls while practicing aerial silk acrobatics. They emphasized the importance of rigorous training and the use of safety equipment to prevent these injuries.<sup>[2]</sup> These various reports confirm the importance of increasing the safety of pole dancing and the need to immediately evaluate any resultant acute injuries.

In 2020, Dittrich *et al.*<sup>[4]</sup> reported four patients with pole dancing trauma: A clavicle fracture, L2-L4 transverse process fractures, a cranial contusion, and an ankle sprain. In 2009, Shrier *et al.* reported a rate of craniocervical injuries of 1.4/1.000 performances for reported Cirque Du Soleil acrobats, slightly lower than upper extremity injuries occurring 2.2/1.000.<sup>[7]</sup> Wanke *et al.*, in 2012, evaluated 169 circus school students and reported that 15.1% developed cervical spine injuries due to accidents while practicing<sup>[8]</sup> [Table1].

## CONCLUSION

Pole dancing is an emerging sport which carries an inherent risk of serious cervical spine injury, particularly when patients sustain falls while inverted. Once these accidents occur, they must be expeditiously recognized and treated to avoid permanent neurological sequelae.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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