

## Abstract

Burning Hands Syndrome is an unusual variant of central cord syndrome. There have been few published reports, and none in the emergency medicine literature. We present a case of Burning Hands Syndrome in which there were no computed tomography (CT) findings of cervical spine injury and only subtle magnetic resonance (MR) abnormalities. We discuss the importance of early diagnosis, as the optimal management of these patients ultimately depends upon prompt recognition of the underlying cervical trauma and a spinal cord at risk for further injury.

## Introduction

The unfamiliar complaint of “burning hands” after a relatively minor injury may be easily overlooked (1). In the emergency department (ED) setting, “burning hands” may allude to different pathologies such as literal thermal injury, a cultural expression of somatic symptoms, hallucination, and rarely a manifestation of spinal cord injury. Despite advances in imaging technology to detect both anatomical and physiological spinal cord injuries, Burning Hands Syndrome may present with subtle or no imaging abnormalities. The syndrome may have overlapping symptoms with injuries such as Brown-Sequard syndrome, brachial plexus injury, and anterior cord syndrome, spinal fractures, dislocations, contusions, ligamentous injury, vascular injury, and bilateral peripheral nerve root avulsions (2,3). We present a case of Burning Hands Syndrome with subtle radiologic findings of mild cord compression that was fortunately recognized and managed early in the ED.

## Case Description

A 49-year-old male was brought to the ED by emergency medical services after a fall. His chief complaint was “My hands are on fire” and was unable to recall the events leading up to his presentation. He was awake, alert, and had a cervical collar in place. His heart rate was 91 beats per minute, blood pressure 161/91 millimeters of Mercury, temperature 98 degrees Fahrenheit, and respiratory rate 20 per minute with 100% oxygen saturation on room air. His primary survey was intact, and the Glasgow Coma Scale was 15. The secondary survey revealed no cervical spine tenderness or step-off, and normal rectal tone, strength, reflexes, motor function, and sensation of his lower extremities. All phalanges of the hands were flexed at the joints with the inability to actively further flex or extend, and there was hyperesthesia distal to the metacarpophalangeal joints; as a result, the sensory exam was limited secondary to pain. Due to an unclear injury mechanism, CT of the head, cervical spine, and maxillofacial bones, and plain radiography of both hands were obtained. This imaging revealed mild retrolisthesis of C3 and degenerative disc disease of the cervical spine (Figure 1).

**Figure 1:** Lateral CT of the cervical spine. There is mild C3 retrolisthesis (white arrow) and degenerative disc disease.



The tertiary survey did not reveal any additional findings. Trauma and Neurosurgery services were consulted for suspicion of cervical spine injury. Magnetic resonance imaging of the cervical spine demonstrated abnormalities resulting in mild cord compression (Figure 2).

**Figure 2:** Lateral MR of the cervical spine. There is a slightly small spinal canal on a congenital basis due to short pedicles. Multilevel disc protrusions are most pronounced at C3-4, where there is mild cord compression (white arrows).



The patient was admitted to the surgical intensive care unit for neurologic monitoring and downgraded within 24 hours as his symptoms improved. Surgical decompression was not necessary. The patient was discharged on hospital day five with a rigid Aspen<sup>®</sup> cervical collar and the plan for continued physical therapy and neurosurgery re-evaluation. Unfortunately, the patient was lost to follow-up.

## **Discussion**

Burning Hands Syndrome is a rare presentation of central cord syndrome following cervical spine injury. Schneider et al initially described central cord syndrome in 1958 through a series of case reports of cervical spine trauma (4). Central cord syndrome is characterized by decreased strength, pain, and temperature sensation with greater deficits in the upper than lower extremities. The corticospinal and spinothalamic tracts lie centrally within the spinal cord, with the upper extremity tracts medial to the lower extremity segments. When compression or injury occurs, the central portion becomes affected by external pressure to a larger extent than the peripheral segments resulting in relatively greater deficits in the upper extremities. Central cord syndrome is usually seen in older patients with preexisting cervical spondylosis or stenosis who sustain a hyperextension injury (5). The patient in our report had degenerative disc disease as well as a congenitally small spinal canal which may have predisposed him to central cord injury and Burning Hands Syndrome.

Burning Hands Syndrome was first described in football players by Maroon in 1977 as bilateral burning dysesthesias and paresthesias in the hands (2). In contrast, “stinger syndrome” or “burners” involves the same symptoms transiently but is unilateral and thought to be caused by trauma to the brachial plexus or nerve roots. Both syndromes are common in patients with spinal cord stenosis and often seen in collision sports (6). In athletes, return to play is recommended after complete resolution of symptoms with suggested neck collars. Burning Hands Syndrome is, at the least, significant in that it can identify a spinal cord at high risk of injury. Without proper precaution, a partial or incomplete spinal trauma, which has the potential for complete recovery, may be converted by indiscreet movement into a complete spinal cord transection with quadriplegia (2).

The exact pathophysiology of Burning Hands Syndrome remains obscure. Despite negative imaging findings of spinal cord injury, ligamentous instability allowing transient movement between vertebral bodies may result in brief compression of the spinal cord (1). The hand symptoms of burning dysesthesias and paresthesias are thought to be due to central spinothalamic tract irritation from traumatically induced edema, contusion, or associated vascular insufficiency (2). The fibers of the corticospinal and spinothalamic tracts that innervate the fingers are located most centrally, and anatomically, they may be the most sensitive to the surrounding, traumatic changes (4).

The diagnosis of Burning Hands Syndrome in the ED is vital to limit delay of care and progression of neurologic injury. A high index of suspicion for spinal cord injury regardless of radiographic confirmation should prompt immediate cervical spine immobilization. Steroid use is often recommended. However, a 2016 meta-analysis of primarily observational study data did

not demonstrate a significant long-term benefit of methylprednisolone in patients with acute traumatic spinal cord injury (7). Surgical decompression or fixation is indicated in patients with unstable cervical spine fracture or progressive neurological symptoms in the presence of cord compression (8). The non-operative approach is similar to management of central cord syndrome: pain control, physical rehabilitation, and occupational therapy. Rehabilitation regimens are patient-specific with a focus on strengthening the preserved muscular activity of the lower extremity, core, and balance to support more fine movements of the upper extremity. Definitive treatment is uncertain because it is individualized and can include surgery, rehabilitation, or a combination of both. Interdisciplinary involvement with nursing and psychiatry has been associated with promising outcomes and an excellent prognosis (9).

## Conclusion

Burning Hands Syndrome is an unusual variant of central cord injury that may be misdiagnosed. Prompt detection in the ED will allow early cervical spine immobilization, expedite imaging, and prevent delay of care and progression of neurologic injury.

## References

1. Wilberger JE, Abla A, Maroon JC. Burning Hands Syndrome Revisited. *Neurosurgery*. 1986;19(6):1038-1040. doi:10.1227/00006123-198612000-00025
2. Maroon JC. "Burning Hands" in Football Spinal Cord Injuries. *JAMA*. 1977;238(19):2049-2051. doi:10.1001/jama.1977.03280200061022
3. Rich V, McCaslin E. Central cord syndrome in a high school wrestler: A case report. *J Athl Train*. 2006;41(3):341-344.
4. Schneider RC, Cherry G, Pantek H. The syndrome of acute central cervical spinal cord injury; with special reference to the mechanisms involved in hyperextension injuries of cervical spine. *J Neurosurg*. 1954;11(6):546-577. doi:10.3171/jns.1954.11.6.0546
5. Brooks NP. Central Cord Syndrome. *Neurosurg Clin NA*. 2017;28(1):41-47. doi:10.1016/j.nec.2016.08.00
6. Meyer SA, Schulte KR, Callaghan JJ, et al. Cervical Spinal Stenosis and Stingers in Collegiate Football Players. *Am J Sports Med*. 1994;22(2):158-166. doi:10.1177/036354659402200202
7. Evaniew N, Belley-Côté EP, Fallah N, Noonan VK, Rivers CS, Dvorak MF. Methylprednisolone for the treatment of patients with acute spinal cord injuries: A systematic review and meta-analysis. *J Neurotrauma*. 2016;33(5):468-481. doi:10.1089/neu.2015.4192
8. Rath N, Balain B. Spinal cord injury—The role of surgical treatment for neurological improvement. *J Clin Orthop Trauma*. 2017;8(2):99-102. doi:10.1016/j.jcot.2017.06.016
9. Vining RD, Gosselin DM, Thurmond J, Case K, Bruch FR. Interdisciplinary rehabilitation for a patient with incomplete cervical spinal cord injury and multimorbidity. *Med (United States)*. 2017;96(34). doi:10.1097/MD.00000000000007837