



Case Report

Brown-Sequard syndrome associated with hangman fracture after blunt trauma: A case report

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Received : 05 September 2021

Accepted : 31 March 2022

Published : 15 April 2022

DOI

10.25259/SNI_897_2021

Quick Response Code:



ABSTRACT

Background: The association of Brown-Sequard syndrome (BSS) and hangman fracture (HF) is rarely reported.

Case Description: We present a case of a 28-year-old female with a HF sustained after a motor vehicle accident and BSS. Diagnosis was established based on typical loss of motor function ipsilaterally and loss of pain and temperature sensation contralaterally. Furthermore, magnetic resonance imaging delineated the location of the injury to the right side of the spinal cord at cervical level 2. Near-complete neurological recovery was achieved after anterior fusion and fixation at cervical level 2-3 after 8 months of follow-up.

Conclusion: HF from blunt trauma can be directly associated with BSS. Surgery was effective and associated with a near-complete resolution of symptoms.

Keywords: Axis fracture, Blunt trauma, Brown-Sequard syndrome, Hangman's fracture, Incomplete spinal cord injury

INTRODUCTION

Brown-Sequard syndrome (BSS) is an incomplete form of spinal cord injury with ipsilateral loss of motor function and proprioception and contralateral loss of pain and temperature sensation.^[5] It is typically associated with penetrating trauma^[10] and pathologically involves one lateral side of the spinal cord. It is the third most frequently encountered form of syndromic incomplete spinal cord injury.^[6] BSS may also be caused by blunt trauma.^[6]

Traumatic fractures of the axis represent second highest among all cervical fractures.^[12] However, only 8.5% of cervical spinal cord injuries are attributed to axis fractures, indicating that axis fractures have a lower incidence of spinal cord injury when compared to other cervical levels of injury.^[3] The association of BSS and hangman fracture (HF) has rarely been reported.^[2] We present a rare case of direct association of a HF with BSS.

CASE REPORT

A 28-year-old female presented acutely after a motor vehicle accident (MVA). She disclosed a right hemiparesis being unable to move the right side against gravity with loss of the right-sided

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proprioception and left-sided sensory dysfunction which after detailed examination consisted of difficulty with temperature and pain sensation. Proprioception was intact on the left. Imaging studies disclosed a HF on computed tomography (CT) [Figure 1] and spinal cord injury on magnetic resonance imaging (MRI) [Figure 2]. CT angiography at time of admission did not reveal obvious vascular trauma to the main arteries in the neck and skull base region. On index MRI, the spinal cord signal changes were subtle and not clearly limited to one side of the spinal cord [Figure 2]. There was no compressive source identified. There were no other injuries to the cervical spine, elsewhere. Corticosteroid medication was not administered. Preoperative cervical traction was not applied, because the degree of kyphotic deformity was rather mild. The following day, the patient underwent an anterior cervical 2–3 interbody fusion with plate fixation that went uneventfully. The patient went on to consistently improve her neurological function, and with the aid of physical therapy, she was able to ambulate without assistance at 4 months after surgery with only minimal hemiparesis. A CT disclosed healing of the fracture with surgical fusion [Figure 3]. At 12 days following trauma, repeat MRI disclosed more obvious cord signal changes at the site of injury with demarcation to the right side of the hemi-cord [Figure 4]. At 8 months postoperatively, she was essentially neurologically intact with only very minor subjective temperature sensory dysfunction on her left side. An MRI at this time clearly depicted the location of spinal

cord injury to the right of the spinal cord at cervical level 2 (C2) [Figure 5].



Figure 3: CT scan at 4 months after surgery shows successful fusion at the fractured segment.

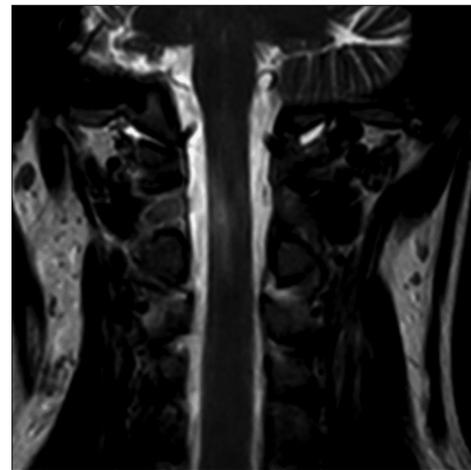


Figure 4: Coronal T2 magnetic resonance image taken 12 days after trauma delineates diffuse spinal cord signal abnormality lateralizing to the right hemi-cord region.

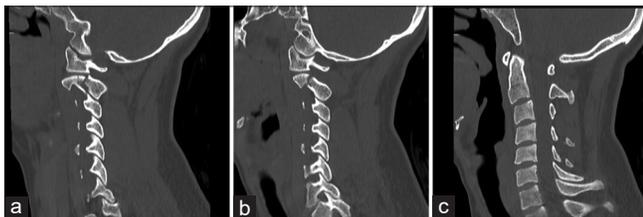


Figure 1: CT scan discloses bilateral C2 pars fractures (a and b) and minimal kyphotic changes at the fractured segment (c).

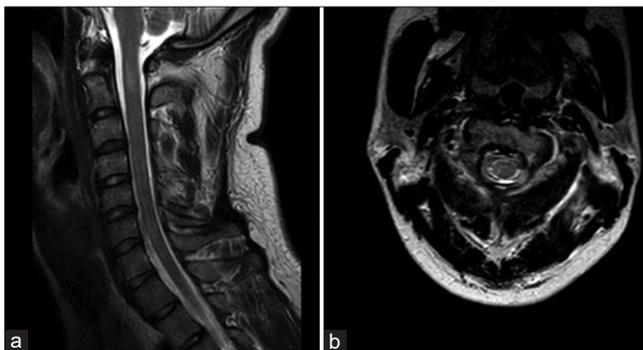


Figure 2: Index T2 MRI images sagittal (a) and axial (b) demonstrate faint, diffuse spinal cord edema at the level of C2 without obvious laterality. No other injuries were identified.

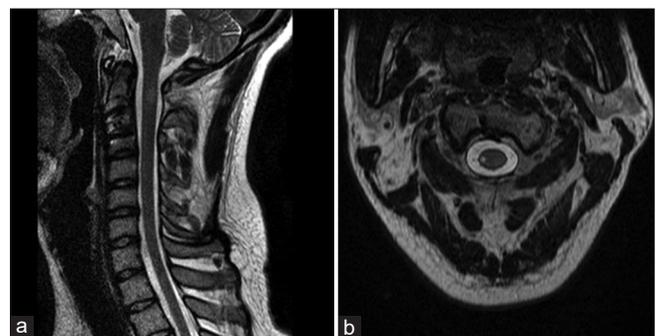


Figure 5: T2 MRI obtained at 8 months follow-up depicts the spinal cord injury at C2 (a). The axial view clearly pinpoints the location of the spinal cord injury to the right lateral cord (b).

DISCUSSION

HF comprises 4% of all cervical spine fractures.^[3] Among all axis fractures, neurological deficit has been attributed to the axis fracture in 8.5%.^[3] Among a larger cohort of HF neurological deficits was found in 6.5%.^[2] This underscores that spinal cord injury has a lesser chance to occur at C2 in general. Unique biomechanics and structure of the axis may contribute to this.^[8]

Moreover, BSS has not been typically associated with HF.^[7] The two reported cases of HF with BSS were due to an indirect association, in which the spinal cord injury was not at the level of the axis.^[4,9] One other case mentioned by Francis *et al.* does not describe details of the injury, hence, not allowing us to determine the association further.

Here, we present pathological imaging proof of a HF with BSS at the level of C2. The follow-up MRI in our case was a key in pinpointing the location of the spinal cord injury to the lateral cord at the C2 segment and therefore clearly depicts a direct relation of the HF and the BSS, since there were no other concomitant cervical injuries. BSS has been shown to have a good prognosis of recovery among incomplete spinal cord injuries.^[6,11] This is confirmed in our case, where a near-total recovery was found to be associated with acute surgical fixation and stabilization. Finally, there are significant differences in the care of cervical fractures among surgeons as exemplified in a review for cervical facet fracture management.^[1] Therefore, our approach in treatment is based on personal preference and may not be representative of care provided elsewhere in general.

CONCLUSION

We present a case of BSS caused directly by a HF after MVA. This is an unusual presentation successfully managed with surgery. MRI obtained on follow-up months after the index trauma pinpointed the anatomic site of spinal cord injury exactly, thereby confirming the clinical diagnosis anatomically.

Declaration of patient consent

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

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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How to cite this article: Foster MA, Gridley DG, Lettieri SC, Feiz-Erfan I. Brown-Sequard syndrome associated with hangman fracture after blunt trauma: A case report. *Surg Neurol Int* 2022;13:150.