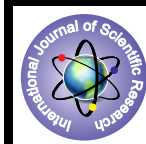


Autonomic Dyreflexia in Case of Brown Sequard Syndrome – Research Paper



Medical Science

KEYWORDS : BSS: Brown Sequard Syndrome BSPS: Brown SequardPlus Syndrome AD: Autonomic Dysreflexia

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ABSTRACT

Background: Brown Sequard Syndrome comprises only about 2% of traumatic spinal cord injury.

Case characteristics: An adolescent female patient suffered a road traffic accident about one year ago which lead to paralysis and loss of proprioception on right side of the body and loss of pain and temperature sensation on left side of the body. Clinically she appeared to be case of Brown SequardPlus Syndrome (BSPS) or Spinal Hemiparaplegia (ASIA D) which in general has a favorable prognosis of ambulation and independence in ADL.

Intervention: Clean Intermittent Catheterization was initiated as part of her bladder management.

Outcome: Autonomic Dysreflexia episodes complicated her initial bladder rehab phase but could be controlled after proactive interventions within a short period.

Message: Autonomic dysreflexia occurs with a frequency of only 6% in ASIA D tetraplegia compared from 25% in ASIA A tetraplegia. The exact percentage of AD frequency in Brown Sequard Syndrome is not available in literature and most large series do not mention about this cardiovascular complication in BSS patients. Pathophysiological mechanism as well indirect correlation from Exercise Pressor Reflex indicates that cardiovascular regulatory mechanism is only minimally disrupted in BSS patients due to the incompleteness of injury. Hence our case underscores the importance of vigilance about a rare but potentially life threatening complication in BSS patients in the early phase of rehab

List of abbreviations: BSS: Brown Sequard Syndrome BSPS: Brown SequardPlus Syndrome AD: Autonomic Dysreflexia ASIA: American Spinal Injury Association MRI: Magnetic resonance imaging NPUAP: National pressure ulcer advisory panel MAS: Modified Ashworth score USG: Ultrasonography SCIM: Spinal Cord Independency Measure SCIC: Self Clean Intermittent Catheterization EPR: Exercise Pressor Reflex

INTRODUCTION

Incomplete spinal cord injury sometimes provides a human jigsaw puzzle to the clinician and the reward for solving it does not merely include achieving a syndromic diagnosis but also immensely help in arriving to a prognosis for future outcome, besides giving the sheer joy of knowing that medicine can be an exact science. Among the multiple syndromes, Brown-Sequard Syndrome (BSS) or spinal hemi-paraplegia had been classically associated with stab injury leading to hemi-section of the spinal cord. 1 Brown Sequard Syndrome (BSS) is described as a syndrome of ipsilateral hemiplegia and proprioceptive loss; and contralateral deficit of pain and temperature sensations. The pure form of BSS is rare and most cases appear partially as the Brown-Sequard-Plus syndrome (BSPS) which consists of asymmetric paresis with hypalgesia more marked on the less paretic side. 2 Cumulatively, BSS and BSPS probably account for about 2-4% of all traumatic spinal cord injuries. 3,4 For the sake of this article we will club them together and refer to both as simply BSS.

Overall, patients with BSS have a favorable outcome. 5 Ruth et al in their study of 38 BSS patients reported continent bladder and bowel function achieved in 89% and 82%, respectively, independent ambulation in 75% and nearly 70% performing functional skills and activities of daily living independently at discharge from rehabilitation. 6

Autonomic dysreflexia (AD) has been extensively reported and investigated since it was first described in 1890 by Bowley. 7 AD is a condition of uncontrolled sympathetic response secondary to a precipitant that generally occurs in patients with injury to the spinal cord at levels of T6 and above. 8 Patients with both complete and incomplete lesions are affected; however it is thought that symptoms are less common and less severe in the latter

group. 9 Patho-physiologically speaking, an incomplete injury or a hemi-section type injury allows the inhibitory parasympathetic signals to travel distally and neutralize the sympathetic overactive discharge. Helkowski et al reported that AD occurs with a frequency of only 6% in ASIA D tetraplegia compared from 25% in ASIA A. 10 BSS, thus being a rare variant of incomplete spinal cord injury naturally mandates a lower incidence of AD. 6

We will describe a case of BSS in our report where AD though being rare, was able to derail the bladder rehabilitation program for few days. Through judicious management the patient could overcome the dreaded complication implying that no disease is so rare as to not deserve the clinician's attention.

CASE REPORT

DB a fifteen year female patient attended the Rehabilitation outpatient department of National Institute for Orthopedically Handicapped, Kolkata on May 2015 with the chief complaint of weakness and numbness of all four limbs plus, bladder and bowel incontinence since last 1 year. She had these complaints after a road traffic accident that she suffered on 17th May, 2014 when a motorcycle hit her and led to immediate unconsciousness of one hour.

MRI imaging revealed a collapsed vertebra (C4) with associated compressive changes of the spinal cord (FIGURE 1). Hence, she was operated upon after twelve days of injury. The surgical procedure done was C4 vertebral corpectomy along with mesh cage and bone graft supported by titanium plate fixation of C3 to C5. Post operatively she was given a Philadelphia collar which she used for one month after discharge from hospital.

When she visited our rehabilitation institute after a year of her injury (May 2015), she had achieved sitting balance but transfer techniques were not learned and standing trial was not even tried. Also her upper extremity and hand function was poor. Regarding integumentary system, there were a NPUAP grade 4 sacral pressure ulcer (5 x 5 cm) and grade 2 inter gluteal cleft pressure ulcer (1 x 1 cm) with another impending one at left greater trochanter. 11 Post operatively, she was discharged with indwelling catheter in situ which she continued for 6 months and afterwards started self-voiding with history of frequent leaks. Bowel

training was also not satisfactory as she was having bowel evacuation every 4th day with occasional soiling despite taking isabgull husk and resorting to rectal enema frequently. There were no history of autonomic dysreflexia for two months post injury but after that she suffered from occasional episodes of facial flushing during exercising or at the time of bowel evacuation.

The initial clinical examination of our patient revealed interesting findings. Her left side had almost intact motor power but the right side was having significant hemiplegia. Similarly right side had more loss of light touch, joint position and vibration sensation but pinprick (pain) and temperature sensation were more involved on the left side. Also deep anal pressure and voluntary anal contraction were present in her. That constellation of features could be explained by a right sided cord hemi-section, leading us to the diagnosis of Brown Sequard Plus Syndrome with neurological level of injury of C4 ASIA grade D. Also there was spasticity of MAS grade 2 on right side and grade 1 on left side.¹²

MANAGEMENT

Comprehensive management protocol was started after admitting the patient for inpatient rehabilitation. Bed mobility, transfer technique and wheelchair training led to independence in her mobility with wheelchair. 5 mg baclofen was given thrice daily which decreased the spasticity. Standing frame tolerance was achieved for about 45 minutes. With the assistance of right side KAFO she started gait training in parallel bar. Regular dressing with normal saline and proper weight shifting technique led to healing of all the ulcers. Also daily timed voiding, fiber rich diet and modified wheelchair with commode seat helped her achieving daily bowel evacuation. Occupational therapy intervention improved her right hand function especially grip strength. Overall she improved her SCIM score from 17 to 49 in three months.¹³

We initially did a USG evaluation for her bladder rehabilitation. It revealed post void residual urine of 180 ml as also thickened bladder wall with irregular cystitis. So, clean intermittent catheterization was introduced although initially the procedure was entrusted with the caretaker (her mother), as the patient was not confident with using left hand. But on the next day morning she developed disabling sweating, flushing, severe headache and palpitation. There was also coldness of her trunk and feet. On examination her systolic blood pressure was 140 mm of mercury i.e., about 30 mm raise over the baseline value, but the pulse rate was normal (82 per minute). She was clinically diagnosed as having an ADEpisode. Search for a causative factor led to the discovery of blood clots inside the urinary bladder blocking the urinary flow. So, she was put into indwelling catheter and bladder wash was given. Though initially the symptoms were relieved, she continued to experience AD episodes as the catheter got blocked many times by blood clots. Concerted effort over 2 days with several bladder washes and few doses of sublingual nifedipine (10 mg) led to subsequent stabilization of the patient condition. It took another 10 days to reintroduce CIC and this time the patient herself could introduce catheter with her left hand. Since then, she is successfully doing SCIC every 4 hourly with an average output of 350 ml till her final evaluation on October, 2015. So, AD had incapacitated bladder rehabilitation of our BSPS patient only in the early phase.

DISCUSSION

Bradycardia was absent in the AD episodes of our patient which though is an important feature of AD, is not always present.¹⁴ More significant finding is however the presence of AD itself in a patient of BSS which is patho-physiologically a rare occurrence, since hemi-section of cord signifies that half of the spinal cord is available for signal transmission especially the inhibitory para-sympathetic signals. Review of literature on case

series of BSS dealing with as small a series as 7 patients to as large a population like 450 patients fail to find any report about AD in them. 6, 15, 16, 17 Also, we have earlier mentioned about the landmark study of Helkowskiet *al* which documented that more incomplete the injury less is the chance of AD.¹⁰

Among others, exercise or unaccustomed physical activities can also be a significant provoking factor for AD, as is found from the history of our patient. The cardiovascular regulating mechanism that allows a normal healthy person to exercise safely is controlled by two primary neural inputs, namely the central command and the Exercise Pressor Reflex (EPR).¹⁸ Due to their synergistic effect, the BP and HR of an exercising patient increases in a co-ordinated manner to meet the increased demand of muscles. But, a complete SCI disrupts the cephalad communication via Group III and IV fibres carrying feedback information for EPR and thus makes it dangerous for those patients to abruptly start exercise. ¹⁹ Investigations by Winchester *et al* demonstrated that EPR remained operative in chronic BSS patient population thus sparing them from AD like dangerous cardiovascular responses on doing physical exercise.²⁰ The lacunae of information about EPR in acute BSS patients was partially fulfilled by Megan N Murphy *et al* by demonstrating operative EPR during exercise in cats immediately after surgical induction of cord hemi-section. ²¹ Thus, AD remains rare in both acute and chronic BSS patients except maybe an occasional flare up in the early phase of rehabilitation, as in our case.

Lastly, the coronal view MRI of our patient demonstrated right sided unilateral laminar fracture thereby corroborating the finding of Pablo Miranda *et al*, who opined that unilateral laminar fracture have a significant association with ipsilateral cord injury and thereby BSS.²²

CONCLUSION

Brown sequard syndrome though is traditionally associated with stab injuries, can occur in spinal cord injury due to road traffic accident also. Unilateral laminar fracture have a significant association with ipsilateral cord injury and thereby BSS. Autonomic dysreflexia is a rare complication to be seen in a case of BSS but still can pose a problem in the early phase of rehabilitation of such patients.

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