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Corticosteroid Effect in Acute Spinal Cord Injury in the Rural Area

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Abstract — Spinal cord injuries (SCI) are devastating traumatic events in the lives of patients, often resulting in severe and/or permanent neurologic disabilities. Nearly half a million people are living permanently disabled in the United States due to traumatic SCI and 12,000–15,000 patients per year incur new injuries. A 78-year-old male patient came to the emergency room with a history of falling from a height with a pelvic position below exposed to trees 30 hours before admission, found weakness in the lower limbs, unable to urinate since yesterday. On radiologic examination, a burst fracture was found in the collumna of the 1st lumbar vertebra. The patient could not be examined for MRI due to limitations and unavailability of equipment at the hospital. The patient was given high dose of Methylprednisolone treatment for 3 days and there was no motoric improvement in the patient. Acute spinal cord injury is a very dangerous disease because it can cause patients both psychological and non psychological disorders. In areas that are left behind and do not have very good facilities and medical personnel to carry out this treatment. There is no treatment option other than using corticosteroids. However, the effect of corticosteroids still needs to be further developed and researched.

Keywords: Acute Spinal Cord Injury, Corticosteroid, Rural Area.

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INTRODUCTION

Spinal cord injuries (SCI) are devastating traumatic events in the lives of patients, often resulting in severe and/or permanent neurologic disabilities. Nearly half a million people are living permanently disabled in the United States due to traumatic SCI, and 12,000–15,000 patients per year incur new injuries [1,2]. Further, the incidence of SCI varies by country with most developed countries reporting incidences of 20–50 per million [3,4]. The event can result in an assortment of immediate sequelae and long-term complications including loss of motor and sensory function, loss of autonomic function, and increased risk of medical complications and death [5]. The largest rise in disability caused by low back pain in the past few decades has occurred in low- and middle-income countries. This surge is possibly because most countries in Asia, Africa and the Middle East are constantly challenged by infectious diseases and therefore remain poorly equipped to deal with the growing burden of disability caused by back and neck pain [6]. Although disability from low back and neck pain is highly prevalent in all working populations across the globe, it particularly becomes a huge concern in low–middle-income countries, where informal employment is common and possibilities for job modification are almost absent and loss of workability leads to poverty [7]. In India, the occurrence of spine pain and related disability is alarmingly rising among the 69% of population, which resides in rural areas [8]. The rural population is engaged in farming and other manually demanding jobs, which puts them at a higher risk of spine pain and related disability. Moreover, both rural and tribal people face limited access to quality health services. Tribal communities which represents 8.6% of India's population are even more challenged because of higher incidence of poverty and low level of education which includes healthcare awareness [8]. The pathophysiology of TSCI involves a sequential order of events categorized into two phases. The primary injury results from compression of the spinal cord by pressure from bony fragments, blood products, soft tissue, and/or foreign objects. Vasogenic shock follows the inciting event and results in spinal cord ischemia. Soon after the onset of the first insult, there is a release of cytokines and vasoactive proteins that cause

inflammation and cord edema, worsening the ischemia and promoting cell death [9]. Dying neurons release free radicals and fail to reuptake glutamate neurotransmitters, resulting in oxidative damage and excitotoxicity [10,11]. Methylprednisolone and other corticosteroids, such as dexamethasone, are potent synthetic glucocorticoids that are thought to counteract the inflammatory response encountered during the secondary injury phase of traumatic SCI through upregulation of anti-inflammatory cytokines and inhibition of lipid peroxidation of neuronal cell membranes [12,13]. Current knowledge on the use of Methylprednisolone strongly relies and builds on the results of historical large-scaled randomized clinical trials (RCTs). While their interpretation and implementation into clinical practice has been a source of contentious debates [14-18].

CASE ILLUSTRATION

A 78-year-old male patient came to the emergency room with a history of falling from a height with a pelvic position below exposed to trees 30 hours before admission, found weakness in the lower limbs, unable to urinate since yesterday. He was not on any medication, and he was not an active tobacco smoker. At the time of admission, his blood pressure was 130/90, his pulses were 76 beats/minute, and he was afebrile with a temperature of 36.7°C. Upon physical examination, a palpation found suprapubic hard palpable and vesica urinaria full palpable. On neurological examination, motor weakness was found in both limbs and both limbs felt thick and tingling and the patient could not lift both thumbs. On prick test examination perianal sensation can still be felt and on rectal examination muscle tone sphincter ani is still adequate. Other physical examination findings were normal. In the supporting examination, blood sugar, liver function, kidney function were checked within normal limits. On radiologic examination, compression fracture was found in 1st lumbar vertebra (Fig. 1). The patient could not be examined for MRI due to limitations equipment at the hospital. The patient was given high dose of Methylprednisolone treatment for 3 days and for non-pharmacological therapy a rigid lumbar support is given to reduce movement. For the evaluation of the patient after 2 weeks, there was still no difference in the patient's movement and the motoric and sensory evaluation still did not improve. On first time he came we have suggested that the patient be referred to a city with better facilities for treatment at an orthopedic specialist or neurosurgeon. but the patient did not want to be referred due to limited costs. Evaluation 2 weeks after the incident we still suggested that the patient be referred to a better city but due to limitations the patient did not go to be referred.

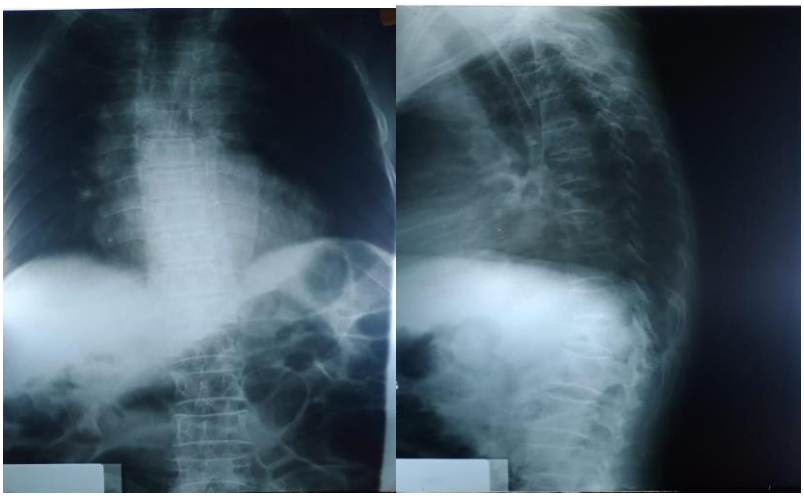

Fig. 1. Radiologic examination Thoracolumbal appearance compression fracture in 1st lumbar vertebra.

DISCUSSION

The instant in which a traumatic spinal cord injury (SCI) occurs has far-reaching physical, social and financial consequences for both patients and their families. Despite decades of progress, effective neuroregenerative therapies capable of

restoring neurologic and functional recovery in patients with SCI are lacking. Methylprednisolone is an U.S. Food and Drug Administration–approved agent that is being used in appropriate clinical settings in an attempt to improve function after acute SCI, in part because of its ability to inhibit lipid peroxidation and inflammation [20,21]. The results of the Second National Acute Spinal Cord Injury Study (NASCIS) II and III clinical trials demonstrated that when begun within 8 hours after SCI in patients, administration for 24–48 h of high-dose Methylprednisolone has been demonstrated to improve functional neurological recovery [20-22]. However, a number of adverse effects of this treatment in patients with acute SCI have been reported, including immunosuppression, susceptibility to infection, wound complications, gastric bleeding, sepsis, diabetic complications, pneumonia, and acute corticosteroid myopathy [22]. In 2019, Liu et al performed a systematic review of 16 studies regarding high dose Methylprednisolone as a treatment for acute SCI. The meta-analysis evaluated 1863 patients and concluded that Methylprednisolone treatment was not significantly associated with improved outcomes. Patients were not found to have an increase in motor score, sensory recovery, or ASIA grade [23]. In this area, there are not adequate facilities for further examination such as MRI and CT. therefore there is still very little that we can do. In cases of Acute Spinal Cord injury we are better off referring to more adequate facilities that have orthopedic or neurosurgeon specialists for surgery. when we want to refer patients it is often not an easy thing because the access to the destination is difficult and takes a lot of time and many of the patients have a poor education level. In rural areas we can only do a primary survey and provide corticosteroids for pharmacological therapy and for non-pharmacological therapy cases we can only provide a rigid lumbar brace. In this patient there was no improvement in the administration of methylprednisolone. there was no improvement in either the sensory or motoric scoring. In our study, the tribal population had slightly higher point prevalence of spine pain compared to the rural. We hypothesize that this may be due to tribal people being more involved in physically demanding jobs than their rural counterparts. Work exposure to lifting, bending, awkward postures and physically demanding, strenuous manual tasks are associated with increased risk of developing low back pain in low- and middle-income countries [24]. Our findings echo with previously reported musculoskeletal debility from repetitive, prolonged work demands in subsistence communities, which report that activities such as drawing water from wells, carrying water and farming contribute to an increased risk of musculoskeletal disorders [25].

CONCLUSION

Acute spinal cord injury is a very dangerous disease because it can cause patients both psychological and non psychological disorders. In areas that are left behind and do not have very good facilities and medical personnel to carry out this treatment. There is no treatment option other than using corticosteroids. However, the effect of corticosteroids still needs to be further developed and researched. Lack of transport facilities and loss of daily wages from work absenteeism emerged as two most common reasons for delaying treatment at the rural health center. We hope that better treatment can occur, especially in remote areas, regarding the scoring system related to treatment for spinal cord injury.

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