


CASE REPORT

Rehabilitation of a patient with spinal cord decompression sickness: First case report from Saudi Arabia

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Abstract

This case brings attention to development of rehabilitation protocols for patients with decompression sickness (DCS). A lack of data regarding DCS renders the need of conducting multicenter studies to document the epidemiology and outcomes of spinal cord DCS in Saudi Arabia.

KEYWORDS

decompression sickness, rehabilitation, Saudi Arabia, spinal cord injuries

1 | REHABILITATION OF A PATIENT WITH SPINAL CORD DECOMPRESSION SICKNESS: FIRST CASE REPORT FROM SAUDI ARABIA

Spinal cord is the most common neurological site of injury secondary to decompression sickness (DCS). Spinal cord decompression sickness (SCDCS) may be associated with lesions in the white matter of spinal cord secondary to bubble embolization of epidural venous system.^{1,2} It is hypothesized that the nitrogen bubbles easily lodge at the thoracic level due to restricted mobility of thoracic vertebra secondary to restriction by the rib cage, hence lesions in DCS frequently occur at the level of thoracic cord.^{2,3} The volume and location of these bubbles determine symptomatology and often results in motor weakness, sensory impairment, pain, and bladder and bowel incontinence.⁴ The reported risk factors include spinal canal stenosis, obesity, alcohol intake, fatigue, temperature, work load, equipment, and fitness level of the diver.⁵⁻⁷ Scoring

system by Boussuges et al predicts outcomes of SCDCS using various historical and clinical parameters at presentation.^{8,9} Data suggest that most of the research focuses on acute care and recompression therapies; however, information regarding outcomes of patients with SCDCS undergoing inpatient rehabilitation is lacking. In Saudi Arabia, motor vehicle accident is the leading cause of spinal cord injury (SCI) which accounts for nearly 80% of the cases undergoing inpatient rehabilitation with male to female ratio of 9:1.^{10,11} Given the predominance of traumatic injuries in the country, DCS is a rare entity, and rehabilitation care of patients with SCDCS is even much rare. This report is aimed to document the rehabilitation aspects and outcomes of the first reported case of SCDCS in the country receiving a comprehensive inpatient rehabilitation program.

2 | CASE REPORT

A 40-year-old male, recreational diver and teacher by profession, with no known comorbidities, was admitted to SCI

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rehabilitation unit for comprehensive rehabilitation program after five months of sustaining SCDCS. History revealed that he went for diving in the Red Sea and dived to the depth of 197 feet twice. Each dive lasted for around 30 minutes. After finishing the dive, he noticed progressive back pain associated with difficulty in walking for which he sought medical attention. Upon initial presentation in acute care, he was assessed to have progressive weakness in the lower extremities with sensory impairment at T 10 level and loss of bladder control. After clinical and radiological assessment, he was diagnosed with SCDCS and underwent seventy sessions of hyperbaric oxygen therapy and reported mild improvement in lower limb weakness. Information regarding acute care treatment and neurological progress was limited due to lack of access to medical records in the referring hospital. He later continued as outpatient physical therapy till admitted to our specialized SCI rehabilitation unit. Upon admission to rehabilitation, he was assessed to have American Spinal Cord Injury Association Impairment Scale (ASIA)¹²- C at T10 level. By this time, he was able to walk outdoor distances using a walker with slow speed and short steps. He had fair static standing balance and poor dynamic standing balance. He was incontinent to bladder and bowel and was using diapers. His main barrier in function was spasticity in the lower extremities which was interfering with his gait speed, safety, transfers, and toileting. He had modified Ashworth scale grade III spasticity in hip adductors, knee flexors, and ankle planter flexors in both lower extremities with impaired sensations to light touch below T 10. One of the priorities of the patient was to achieve social continence to bladder and bowel.

Patient underwent seven weeks of comprehensive inpatient rehabilitation program and received 3 hours per day rehabilitation services from physical therapy, occupational therapy, rehabilitation nursing, dietician, recreational therapy, and rehabilitation medicine specialists. Physical therapist focused on treatment of spasticity, strength and balance training, transfers, ambulation and stair climbing, whereas the occupational therapist focused on maximizing the functional independence in toileting, activities of daily living, equipment provision, and home modifications. A high-protein dietary regime was established under dietician. Patient was enrolled in recreational therapy program to improve emotional and mental coping to new lifestyle since he had been an active scuba driver. The comprehensive rehabilitation program was carried out under supervision of rehabilitation physician responsible for medical and rehabilitation care of the patient. The functional goals of rehabilitation were to improve transfers, gait safety, and stair climbing with special focus on neurogenic management of bladder and bowel. Ultimately, goals were to socially empower the patient to return to his previous role as teacher. He was started on aggressive regime for spasticity

management including stretching, range of motion, ankle foot orthosis, positioning, functional training, and oral medications. He was started on baclofen which was increased to 25 mg orally three times daily. Amitriptyline 25 mg oral was added at nighttime for neuropathic pain in lower extremities and to facilitate sleep. Patient achieved social continence with clean intermittent catheterization four hourly with solifenacin 5 mg orally daily. There were no episodes of urine leakages at the time of discharge. He was also trained to manage his bowels independently by a bowel program regime which would enable him to have empty his bowels on alternate days in the morning at a fixed time. At the time of discharge, patient did not have any episodes of fecal incontinence. He was able to manage indoor walking using hemiwalker, but for outdoor ambulation he used front wheel walker with improved speed and balance. He required minimal assistant for stair climbing and was independent in all activities of daily living. Patient was discharged to home with his wife and five children and resumed his job as a teacher. He was not able to resume recreational diving.

3 | DISCUSSION

Even though there are multiple sea oil refineries in Saudi Arabia, both in Arabian Gulf and along the Red sea, which have extensive under water activities including deep sea diving; it is interesting to observe that DCS in Saudi Arabia is rarely reported in the literature.¹³⁻¹⁶ It could possibly be due to high safety standards and protocols, or merely due to lack of reporting of such cases. Recreational diving is also gaining popularity in the country at professional level; however, the venues for recompression therapies is limited.¹⁵ A global report by Divers Alert Network reported 3 fatalities from 1980 to 1997 in Saudi Arabia.¹⁴ There was one DCS type 1 and one DCS type 2 requiring treatment. A study in Northern Arabian Gulf reported that, out of 50 000 dives occurring between 1993 and 1995, there were 25 incidents of DCS, out of which, twenty-one occurred at the depth between 100 and 160 feet.¹³ Our case dived at much more depth prior to onset of symptoms, and clearly exceeded the zones where most commercial divers developed DCS. The same report identified depth as the only risk factor affecting the outcome negatively.

SCDCS generally carry a good prognosis.¹⁷ Aharon-Peretz reported that 79% of patients with SCDCS reached full recovery; however, most patients had mild symptoms which resolved within a month of recompression therapy.¹⁸ There are no special rehabilitation guidelines for SCDCS; however, Elior et al reported benefit of robotic-assisted body weight support treadmill training in a patient with SCDCS causing Brown-Sequard syndrome.¹⁷ Age less than 45 have demonstrated better outcomes.² Our patient was young and

not known to have any medical illness; and demonstrated considerable functional improvement over time. Generally, patients may not return to diving after SCDCS; however, using paired diving and modified Bühlmann diving algorithm, individuals with chronic SCI may engage safely in recreational scuba diving if they have good cardiovascular fitness.¹⁹ Saudi Arabia has one of the highest rates of motor vehicle accidents and trauma is the most common cause of SCI.²⁰ Options for inpatient rehabilitation are fairly limited in the country and the waiting lists for admission remains one of the challenges to start early comprehensive rehabilitation.²⁰ Delayed rehabilitation care may adversely affect functional recovery in patients with SCI.²¹ Our patient had to wait for few months to be admitted to our facility; however, he established outpatient therapies for gait training after acute care treatment. Dependency in activities of daily living, bowel and bladder incontinence, and debilitating spasticity could have possibly been addressed quite earlier; however, functional priorities among patients with SCI may vary. In a survey on 151 patients with SCI, the top five high-priority areas of functioning were arm/hand use, walking, bladder/bowel control, presence of pain, and sexual function.²² Arm/hand function had the highest preference over other functions while sexuality had the lowest preference when compared with other four functions. It is interesting to note that, even in patients with paraplegia, the arm/hand function remained a priority over walking. This may be attributed to the value of functional independence these patients achieve due to their reliance on upper limbs. To achieve optimal outcomes, it is imperative to prioritize the goals of the rehabilitation program by keeping in view the goals and preferences of the patients and families. A model of SMART goal (specific, measurable, attainable, relevant, timely) is also applicable in goal setting during rehabilitation programs to set realistic goals and establish a clear indication of rehabilitation treatment.

4 | CONCLUSION

Similar to previous reported data regarding SCDCS, our case achieved functional independence in most activities including ambulation. This case not only brings attention to development of national guidelines for acute care of patients with DCS but also necessitates the incorporation of rehabilitation guidelines in DCS. Lack of data renders the need of conducting multicenter studies to document the epidemiology and outcomes of SCDCS in Saudi Arabia.

CONFLICT OF INTEREST

The authors declared no conflicts of interest.

AUTHOR CONTRIBUTIONS

Conceptualization and design of study: Sami Ullah. Data collection: Khaloud Kedwah. Drafting: Sami Ullah, Ahmad Zaheer Qureshi, Afnan AlHargan. Revisiting critically: Asim Niaz, Ahmad Zaheer Qureshi, Final Approval of version: Sami Ullah, Asim Niaz.

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