CASE REPORT

Surfer's myelopathy: an atypical case presentation

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Abstract

Introduction Surfer's myelopathy (SM) is a rare nontraumatic spinal cord injury seen in beginner surfers and people participating in activities involving prolonged lumbar hyperextension. The majority of cases of SM have been reported in younger patients under 40 years of age, with initial magnetic resonance imaging (MRI) showing T2 signal abnormalities. We present a case of SM in a person over 40 years old whose initial MRI did not show the T2 signal abnormalities usually reported in SM.

Case presentation A 43-year-old male in good physical condition went surfing for the first time and developed generalized back pain that progressed to include bilateral lower extremity pain with numbness and weakness. MRI within 11–12 h of symptom onset revealed no acute T2 signal abnormalities. At the time of initial presentation he had classification consistent with a T12 American Spinal Injury Association Impairment Scale (AIS) A and at rehabilitation discharge, 6 weeks later, he had classification of T12 AIS B.

Discussion Not all cases of SM present similarly. As surfing is a popular sport, education on early identification of warning signs is crucial for instructors and trainees, as well as health care providers. Our case highlights the importance of a comprehensive history and physical examination in developing the diagnosis, especially in presentations that are not classic in nature.

Introduction

Surfer's myelopathy (SM) is a nontraumatic spinal cord injury in the setting of prolonged periods of hyperextension with intermittent valsalva when transitioning from laying supine to standing on the surfboard. Several cases of non-surfing SM (variations of SM without surfing) have also been reported [1–4]. The exact etiology of SM remains unclear, but postulated mechanisms include vascular etiology [5, 6].

Though the body of literature remains small, SM has recently been increasingly reported with many cases describing patients under 30 years old [5–18]. Magnetic resonance imaging (MRI) is often completed on initial presentation and almost invariably shows T2 signal abnormalities in the thoracolumbar cord [6]. We add to the

literature a case of surfing-related SM in a 43-year-old male with no acute MRI abnormalities found on initial work-up.

Case presentation

A 43-year-old male in good physical condition with a past medical history of hypertension went surfing for the first time. While surfing over a 90-min period, he paddled out frequently and stood up several times despite developing generalized back pain during his surf session. He returned to the shore before he tried going back out for another session. Upon again returning to shore, he noted increasing back pain and bilateral leg pain with numbness below the knees, along with his legs below his knees cold to touch. Soon after, he developed more intermittent shooting pain into his legs with worsening lower extremity weakness, at which point he was brought to the hospital for further evaluation.

Upon arrival to the emergency department, he was hypertensive with a blood pressure of 155/89; vital signs were otherwise within normal limits. Cranial nerve and upper extremity motor examinations were normal. Motor strength examination of bilateral lower extremities revealed strength of 2+/5 hip abduction, 2/5 hip adduction, 3/5 hip

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flexion, 2+/5 knee flexion, and 0/5 in the following muscle functions: knee extension, ankle dorsiflexion, plantar flexion, and toe extension. Rectal examination revealed “decreased but present (anal sphincter) tone”. Patellar reflexes could not be elicited bilaterally. Further documentation included “upper shin ~50% decreased sensation, and below that, no sensation”. He required catheterization for urinary retention and Solumedrol 125 mg was administered with no immediate effect.

MRI of the patient’s cervical, thoracic, and lumbar spine was performed within 11–12 h of symptom onset. Cervical and thoracic MRI, although somewhat limited by motion, revealed degenerative disc disease at C7-T1 with partial effacement of the ventral thecal sac without spinal cord compression. Lumbar MRI showed grade 1 anterolisthesis at L5-S1 associated with chronic L5 spondylosis. The remainder of the thoracolumbar spine revealed no abnormalities. No significant edema, soft tissue abnormalities, or acute T2 signal abnormalities were noted on MRI.

The following day the individual was evaluated by a neurologist who documented bilateral lower extremity strength of 0/5. For sensation, the note documented that “light touch and temperature modalities were tested and sensation to these modalities was decreased from the iliac crests distally”. In addition, the note documented “reflexes hyporeflexic, rectal tone diminished, and perineal sensation decreased”.

Upon admission to acute inpatient rehabilitation, ~2 weeks after his injury, a comprehensive examination according to the International Standards of Neurological Classification of Spinal Cord Injury was performed; the patient was classified as T12 American Spinal Injury Association Impairment Scale (AIS) A, with diminished rectal tone. Hip flexion was 1/5 bilaterally with bilateral 1/5 knee extension. At the time of discharge, 4 weeks later, he had a classification of T12 AIS B, as deep anal pressure was present on rectal exam. He achieved independence at the wheelchair level for mobility, as well as independence in all activities of daily living including performance of his bowel program, bladder management with independent intermittent catheterization, feeding, grooming, and dressing.

At 6 months post injury, his motor strength improved to 2/5 in knee extension bilaterally, still with 1/5 in hip flexion. He was evaluated for a prescription for permanent knee–ankle–foot orthoses, which he walked up to 70 feet in and was able to use independently for short distances of household ambulation with a rolling walker.

Discussion

The body of literature remains small for SM, with fewer than 100 reported cases [6], with the first published reports in 2004 [5]. The majority of available information on SM to

date has been presented in the form of case series and individual case reports. Most reported cases describe younger individuals, with the mean age previously described as 25 years [11]. A case series published in 2017 suggested that diagnostic criteria include those younger than age 40 years [10].

Though the exact etiology of SM remains unclear, there are several postulated mechanisms, most vascular in origin; these include avulsion of perforating vessels, vasospasm, and ischemia near watershed areas [5, 6]. The artery of Adamkiewicz may also be directly involved through abnormal structure with stenotic regions or thrombotic infarction [14, 15]. It has been suggested that lower thoracic cord perfusion especially depends on the artery of Adamkiewicz due to poor collateralization of the anterior spinal artery in this region [16]. Theories regarding inferior vena cava obstruction in the setting of prone positioning on the surfboard and fibrocartilaginous embolism have also been proposed [19]. Predisposing factors are not yet well defined but are presumed to include male sex, recent air travel, dehydration, and thin body habitus. Our patient was notably in good physical shape with physical activity an integral part of his vocation.

MRI has been deemed effective in early identification of ischemic change and has shown abnormalities in the majority of reported cases of SM [2]. Initial spinal MRI most often shows T2-weighted signal abnormalities in the thoracolumbar cord with the abnormal signal extending to the conus [6, 13, 14, 16, 20, 21]. In a review of 23 cases of SM, Nakamoto et al. found that 100% of the cases demonstrated these T2 signal abnormalities [14]. It has been suggested that diffusion-weighted imaging may also play a beneficial role in early detection of cytotoxic edema due to spinal cord infarction [12]. The exact timeframe for development of MRI abnormality is unclear, though many reported cases suggest that MRIs were performed urgently during the emergency room evaluation. T2 signal abnormality has been noted as early as 11 and 8 h after symptom onset [1, 18]. Our patient’s initial MRI performed 11–12 h after symptom onset showed no T2 spinal cord signal abnormalities to suggest SM; diagnosis was based on history and physical exam alone. Chung et al. also reported on a patient with no MRI abnormalities noted 10 h after symptom onset, with development of T2 signal abnormalities 3 days later [8]. We highlight that although urgent MRI is a standard component of the work-up for SM, early MRI may not be diagnostic. More data are needed in this patient population regarding timeline for development of imaging abnormalities and the highest yield imaging techniques for quick diagnosis.

This case presentation serves as an example of spinal cord injury without radiographic abnormality (SCIWORA). SCIWORA was first described in 1982 in the pediatric population, with hyperextension of the vertebral column

among the described neural injury mechanisms [22]. Since its initial description, SCIWORA has now been described in the adult population as well [23]. The advancement of MRI has played a unique role in the evolution of SCIWORA given visualization of soft tissue pathologies, some of which are predisposing factors for spinal cord injury [22]. While our patient demonstrated no acute MRI abnormalities, his imaging did show chronic degenerative changes that may have placed him at greater risk to develop SM.

The prognosis for SM is not clearly defined. The earliest published cases highlighted good motor recovery, while later cases demonstrate mixed prognosis ranging from motor recovery to persistent paraplegia [5, 7, 21]. In a comprehensive review of all 66 cases published at the time of publication, Swinney et al. described that residual symptoms were common, and in some cases patients experienced no improvement [21]. In another systematic review of 64 published cases, Freedman et al. cited a 0% motor recovery rate in AIS A lesions, though the follow-up period is unclear [11]. Takakura et al. published a case series of three young surfers, all classified as AIS A at nadir, with no change in AIS category over 3–5 months of documented follow up [17]. New cases of SM should continue to be added to the available literature, in order to better classify initial presentations and prognostic outcomes.

Comprehensive rehabilitation in a qualified spinal cord injury center has been described as “the hallmark of clinical therapy [12]”. A 2013 case report highlighted one patient’s recovery when followed across 1 year post injury; initially with neurological level of injury T12 and AIS A, the patient recovered to motor incomplete (AIS C) within the first 6 months [7].

Improved understanding of SM in conjunction with increased awareness may lead to earlier detection and treatment. Our case highlights the need for improvements in awareness of the condition for both instructors and new surfers. The novice surfer will often spend more time lying prone and less time seated on the board, while waiting for waves to approach. Surfing lessons often include a brief period before entering the water, where pop-up techniques are taught and practiced on land. We suggest that during this portion of the surfing lesson, trainees are also given brief education that emphasizes proper seated form on the surfboard in hopes of minimizing unnecessary prolonged spinal hyperextension.

Conclusion

Surfing is a popular sport but one that comes with the risk of both traumatic and nontraumatic spinal cord injury. Education on proper seated form and early identification of warning signs is crucial for instructors and trainees alike. While MRI

may aide in diagnosis, history and physical examination are crucial. In cases where SM does occur, patients may benefit from a comprehensive rehabilitation program to regain functional independence and restore healthy, active lifestyles.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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