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Cervical fracture from chronic steroid usage presenting as a stroke: A case report



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ABSTRACT

INTRODUCTION: Misdiagnosis of Brown-Séquard-like presentations can delay treatment; potentially endangering the positive outcomes a patient might otherwise have had. Stroke mimics can be perceived as signaling the end of urgent investigation and care once stroke is ruled out; however, stroke mimics themselves can require prompt care. Herein, we discuss an extremely rare case where stroke was ruled out, resulting in a lapse in care that lead to an exacerbated hemiparesis over the following week.

PRESENTATION OF CASE: We present a patient with an occult cervical spine fracture with extension of the neck, caused by reduced bone density from a chronic steroid regimen. Nine days after the initial onset of her neurological symptoms, the patient presented to the ED with the complaint of left sided weakness and right-sided sensory loss. She was determined to have a left-sided Brown Séquard syndrome, which resolved following anterior cervical discectomy and fusion at C4-C6 and a laminectomy from C4-C6.

DISCUSSION: This case indicated that patients with dangerously low bone density should be weaned off chronic steroid therapy to prevent the onset of osteoporotic symptoms early in adulthood. Furthermore, this case emphasizes the importance of continued investigation of symptoms if a stroke is ruled out and the need for more diligent monitoring of bone density of chronic steroid users.

CONCLUSION: Stroke mimics can require the same urgency in care and diagnosis as strokes themselves.

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1. Introduction

Trauma, spinal cord lesions and stroke are the most common causes of hemiparesis [1]. These pathologies, especially in an emergent setting of a patient presenting with symptoms of a stroke, can be overlooked. The disparate causes and propensity for misdiagnosis of Brown-Séquard-like presentations can delay treatment and potentially endanger positive outcomes [1,2]. In this case, a cervical spine occult fracture caused the patient's hemiparesis, which was diagnosed nine days after symptom onset. Herein, we present an extremely rare case of cervical extension fractures without trauma that mimicked stroke symptoms and hence delayed treatment.

Abbreviations: ED, emergency department; EMS, emergency medical services; CT, computed tomography; MRT, magnetic resonance therapy; SSEP, somatosensory evoked potentials; DWI, diffusion-weighted imaging; STIR, short tau inversion recovery.

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2. Presentation of case

A 41-year-old female with a history of chronic immunosuppressant and steroid use for juvenile rheumatoid arthritis experienced sudden onset of pain while showering. The pain began along her left shoulder and was followed by progression of numbness and tingling down the arm then weakness of her left shoulder and arm. The emergency medical service was activated but the patient declined to be transported to the hospital, as she was reportedly neurologically intact and stable when EMS arrived. Her symptoms, however, returned and worsened throughout the evening and she presented to the emergency department for evaluation. During the course of her work-up, MRI of her brain and spine were performed and were negative, including DWI and STIR imaging. Two days later, the patient was seen by a neurologist and was diagnosed with a possible brachial plexopathy. The patient's symptoms improved over the next four days. On the sixth day after the onset of her symptoms, the patient's left extremity weakness dramatically worsened and was accompanied by pain. The patient did not immediately return to the ED for evaluation and presented again 3 days later.

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Fig. 1. Sagittal MRI T2 sequence of the cervical spine demonstrating an expanded spinal cord with myelomalacia at the level of C4/5.



Fig. 2. Sagittal CT scan of the cervical spine showing an ankylosed spine.

Nine days after the initial onset of her neurological symptoms, the patient presented to the ED with the complaint of left sided weakness and right sided sensory loss. On exam she was discovered to have a left sided Brown Séquard syndrome involving left hemiparesis and loss of left sided proprioception concurrently with had right-sided loss of pain and temperature sensation. Imaging was reviewed and an MRI of the cervical spine demonstrated evidence of a contused cord on the left side with cord edema and significant ankylosis at C4-5 and C5-6 (Fig. 1). CT scan of the cervical spine demonstrated an ankylosed spine (Fig. 2). Neither the CT, per-



Fig. 3. Post-operative cervical spine X-ray demonstrating an anterior C4-6 fusion and a posterior C2-T1 fusion with well-placed instrumentation.

formed with two millimeter slices as per our trauma protocol, nor the MRI image showed any fracture, though significant enhancing edema was seen in the facet joints at C4-6, significantly different from the initial MRI. The patient was started on high-dose steroids in preparation for urgent surgical intervention.

The patient underwent a two-staged procedure. First, an anterior cervical discectomy and fusion from C4 to C6 were performed. Motor signaling from somatosensory evoked potential (SSEP) monitoring remained stable during the surgery. In the immediate post-operative period her exam remained stable. Two days later, the patient underwent a laminectomy from C3-6 with posterior cervical fusion from C2-T1 (Fig. 3). During the posterior fusion, a clear bilateral fracture was encountered at C4-6 through the facet joints that rendered the spine grossly unstable intraoperatively. With instrumentation, closed reduction, and fusion, stability had been achieved.

The patient tolerated the procedures without further decline in examination or other complications and post-operatively, her deficits gradually improved. The patient was discharged on post-operative day four from the last procedure and her strength in her upper extremities was asymmetric; her right side remained stronger than her left but on her left, she was regaining strength of her deltoid, triceps brachii and biceps brachii muscles. Her strength was also improving in her lower extremities and at the time of discharge, she was able to walk ten feet at a time with assistance.

At her nine week follow-up, the patient's symptoms were significantly improved. Although her left-sided hemiparesis and intermittent bilateral numbness persisted, she now could walk with the assistance of a cane and had only intermittent paresthesias of her legs.

3. Discussion

One fourth of apparent stroke presentations is symptomatic mimics of a stroke [2]. If a stroke is ruled out, trauma, neoplasms, infectious or inflammatory diseases (e.g., transverse myelitis, multiple sclerosis, herpes zoster, and acute bacterial meningitis) should be considered [3]. The above pathologies are very serious; however, the relief that ensues after ruling out a stroke can cause a lapse in care. As demonstrated in this case, the patient's cervical spine pathology was overlooked after a stroke was excluded. The false sense of security after this exclusion allowed the patient's severely unstable spine to worsen. Such a case demonstrates that clinicians should carefully examine imaging of the cervical spine in cases of hemiparesis, even in cases where there is no recent history of trauma.

Even though imaging, specifically CT and MRI, are highly sensitive and specific in identifying spinal pathology, it can be difficult to visualize acute processes in patients with underlying disease. Harrop et al. described a case in which a single-detector CT scan and MRI failed to demonstrate any acute fracture in a patient with ankylosing spondylitis who presented with Brown-Séquard syndrome [4]. A retrospective review done by Finkelstein et al. described twenty-one patients with ankylosing spondylitis and spinal fractures. In seven of the patients, an occult fracture was identified on a delayed basis between 3 h and 22 days [5]. These cases show that even with high resolution imaging, fractures can go undetected initially in patients with chronic inflammatory disease and lead to the delay in treatment. With the benefit of hindsight and surgical exploration, initial MRI and CT scans were reviewed, but no clear fracture pathology could be identified.

Spinal cord injuries that result in Brown-Séquard syndrome-like presentations can be misdiagnosed as cerebral infarction [6]. Acute hemiparesis is a common symptom of both ischemic stroke and cervical spinal lesions, illustrating that cervical spinal lesions should be considered in the differential diagnosis of stroke and vice versa. If a stroke is ruled out in cases of acute onset hemiparesis, MRI of the cervical spine can help exclude Brown-Séquard syndrome. Imaging indicating hemisection of the spinal cord accompanied by ipsilateral hemiparesis suggests Brown-Séquard syndrome, which can also be caused by lesions compressing one side of the spinal cord [1]. The most common etiologies of Brown-Séquard syndrome are trauma, more commonly penetrating spinal rather than blunt trauma, and neoplasms. Less common causes are cases presenting with transverse myelitis, multiple sclerosis and bacterial meningitis [7].

The case presented herein highlights the importance of the differential diagnoses of stroke. Neck pain associated with acute hemiparesis is more commonly a symptom of cervical spine lesions, which can aid in the differential diagnosis. Most importantly, if stroke is ruled out, the investigation and monitoring of symptoms should continue until a diagnosis is made.

Of interest, this patient's Brown-Séquard presentation was not caused by trauma, neoplasm or inflammatory or infectious processes, but by extending her neck. Her cervical spine fracture is hypothesized to be due to reduced bone mineral density from a chronic steroid regimen to treat juvenile rheumatoid arthritis [8]. Arthritis and steroid use independently increase the risk of fractures; in conjunction, where patients take steroids to treat arthritis, the odds of having a fracture increase by 2.7 times [9].

Although juvenile rheumatoid arthritis is most commonly treated by NSAIDs and methotrexate, children who are unresponsive to nonsteroidal treatment often resort to glucocorticoid treatment to manage their inflammation. Systemic low doses of prednisone or intravenous administration of methylprednisone often improve arthritic symptoms; however, chronic steroid use can lead to cataracts, increased susceptibility to infection, growth

suppression, and, as seen in this case, fracture [10]. Chronic steroid use can be detrimental and perhaps counterproductive to the patient's overall health several years after the painful withdrawal process. The case of several cervical spine fractures resulting from simple head extension suggests that the bone mineral density of patients on long-term steroid use should be monitored starting at an early age and that a certain threshold of bone density should be impermissible. Patients with dangerously low bone density should be weaned off chronic steroid therapy to prevent the onset of osteoporotic symptoms early in adulthood.

4. Conclusion

This case highlights the important fact that stroke mimics can require the same urgency in care and diagnosis as strokes themselves. Secondly, this case supports the need to more vigilantly monitor bone density in patients taking steroids chronically in order to prevent future fractures. And thirdly, occult fractures must be highly suspected in patients with neurological symptoms and normal imaging that have a history of chronic inflammatory disease.

Conflict of interest

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Ethical approval

N/A.

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Nothing to declare.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent form is available for review by the Editor-in-Chief of this journal on request.

Authors contributions

Christian Fisahn: study concept, study design, data acquisition, drafting the manuscript.

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References

- [1] R. Tattersall, B. Turner, Brown-Sequard and his syndrome, *Lancet* 356 (2000) 61–63.
- [2] P.M. Fernandes, W.N. Whiteley, S.R. Hart, R. Al-Shahi Salman, Strokes: mimics and chameleons, *Pract. Neurol.* 13 (2013) 21–28.
- [3] H. Matsumoto, T. Miki, Y. Miyaji, H. Minami, A. Masuda, S. Tominaga, Y. Yoshida, I. Yamaura, S. Matsumoto, S. Natsume, K. Yoshida, Spontaneous spinal epidural hematoma with hemiparesis mimicking acute cerebral infarction: two case reports, *J. Spinal Cord Med.* 35 (2012) 262–266.
- [4] J.S. Harrop, A. Sharan, G. Anderson, A.S. Hillibrand, T.J. Albert, A. Flanders, A.R. Vaccaro, Failure of standard imaging to detect a cervical fracture in a patient with ankylosing spondylitis, *Spine (Phila. Pa 1976)* 30 (2005) E417–E419.
- [5] J.A. Finkelstein, J.R. Chapman, S. Mirza, Occult vertebral fractures in ankylosing spondylitis, *Spinal Cord* 37 (1999) 444–447.
- [6] H. Shima, M. Yasuda, M. Nomura, K. Mori, K. Miyashita, A. Tamase, Y. Kitamura, K. Osuka, M. Takayasu, A spinal epidural hematoma with symptoms mimicking cerebral stroke, *Nagoya J. Med. Sci.* 74 (2012) 207–210.
- [7] P. Miranda, P. Gomez, R. Alday, A. Kaen, A. Ramos, Brown-Sequard syndrome after blunt cervical spine trauma: clinical and radiological correlations, *Eur. Spine J.* 16 (2007) 1165–1170.
- [8] V. Naganathan, G. Jones, P. Nash, G. Nicholson, J. Eisman, P.N. Sambrook, Vertebral fracture risk with long-term corticosteroid therapy: prevalence and relation to age, bone density, and corticosteroid use, *Arch. Intern. Med.* 160 (2000) 2917–2922.
- [9] C. Cooper, C. Coupland, M. Mitchell, Rheumatoid arthritis, corticosteroid therapy and hip fracture, *Ann. Rheum. Dis.* 54 (1995) 49–52.
- [10] K.N. Kim, Treatment of juvenile rheumatoid arthritis, *Korean J. Pediatr.* 53 (2010) 936–941.

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