

Acute cervical spinal epidural hematoma: A rare complication of spinal manipulation in a healthy adolescent

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Abstract

Cervical spinal manipulation is considered to be a safe procedure for treating patients with neck pain and muscle-tension headache. Rarely has acute cervical spinal epidural hematoma after spinal manipulation been reported. Here, we report a 16-year-old healthy male adolescent who presented with progressive weakness in the right extremities following acute neck and shoulder pain after spinal manipulation from Acute cervical spinal epidural hematoma with compression of spinal cord. After emergency surgery the patient had full recovery from the profound neurological deficits.

INTRODUCTION

Spinal epidural hematoma (SEH) is an uncommon entity but an important cause of spinal cord compression. SEH may occur with injuries associated with a cervical dislocation fracture, coagulopathies, thrombocytopenia, hemophilia, and immune diseases such as ankylosing spondylitis and Paget disease.^{1,2} However, acute SEH as a consequence of spinal manipulation is extremely rare, with less than 10 cases reported in the English literature.³ We report here a case of acute cervical SEH in a healthy adolescent male, that occurred after spinal manipulation. The relevant literature is also reviewed.

CASE REPORT

A 16-year-old healthy male adolescent presented with acute neck pain with radiation to the right shoulder 5 minutes after spinal manipulation by foot pressure by a friend who weighed about 60 kg. He complained of progressive weakness in the right limbs, especially the right lower extremity, one hour later. He was sent to our emergency department. On examination, he had dysesthesia in both right extremities. Muscle power was scored as grade 4 over 5 in the right upper extremity, grade 0 over 5 in the right lower extremity, and grade 5 over 5 in the left extremities. Deep tendon reflexes were all increased in the extremities

bilaterally. A rectal examination revealed normal tone. Babinski's sign was present on the right side, and Hoffmann's signs were absent. Laboratory testing results were unremarkable.

Radiographs of the cervical spine revealed no obvious fractures. A computed tomographic scan of the cervical spine revealed a hyperdense epidural mass extending from the C3 to C6 level, causing spinal cord compression. Magnetic resonance imaging (MRI) of the cervical spine revealed that this epidural mass was mainly located in the right posterolateral aspect of the spinal canal from the C3 to C6 level (Figure 1). The lesion appeared as high signal intensity and a dark signal rim on T2-weighted images, and intermediate signal intensity on T1-weighted images. Based on the clinical picture and radiological findings, acute cervical SEH was suspected. The patient underwent emergency right open-door laminoplasty from the C3 to C6 level to evacuate this space-occupying hematoma 2 hours after admission. During the operation, an acute hematoma located in the right posterolateral aspect of the spinal canal was demonstrated (Figure 2). No obvious vascular abnormalities were found intraoperatively. Pathological examinations revealed hemorrhage without evidence of neoplasm or vessel malformation. The postoperative course was uneventful with progressive complete recovery from the profound deficits.

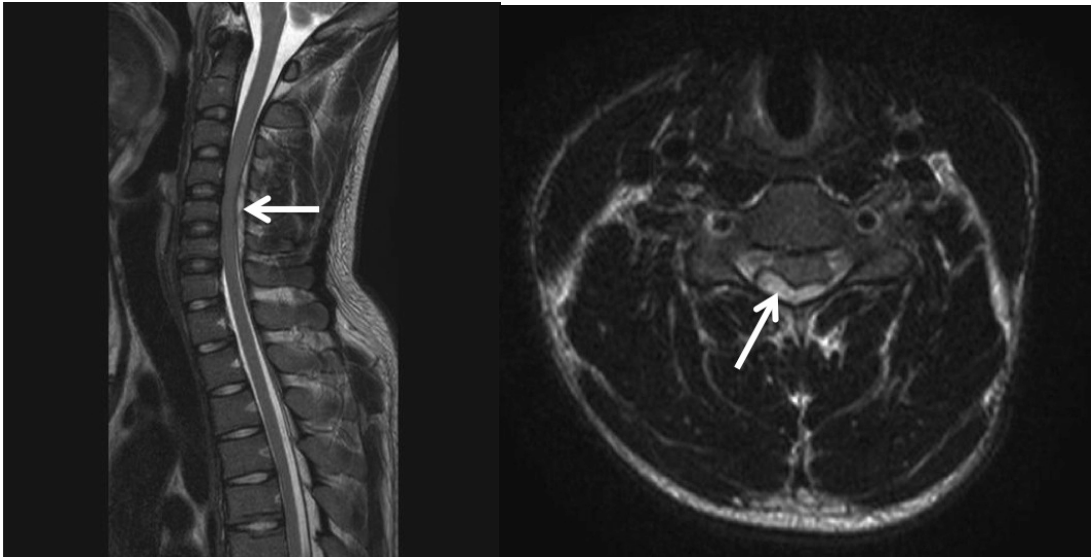


Figure 1. T2-weighted magnetic resonance images of cervical spine revealed a high intensity lesion (white arrow) extending from C3-6 (A) and mainly located in the right posterolateral aspect (B) of the spinal canal with compression of the cord.

DISCUSSION

Spinal epidural hematoma is an uncommon condition which may lead to devastating complications. Based on the predisposing cause, SEH is divided into spontaneous and traumatic types. SEH occurs spontaneously without an identifiable cause in 40% to 50% of reported cases and the precipitating factors include concurrent coagulopathy, vascular malformations, neoplasm, blood dyscrasia, and pregnancy.^{2,4} Traumatic SEH is relatively uncommon and

accounts for less than 1% to 1.7% of all spinal injuries.² Most traumatic SEH are associated with vertebral trauma, penetrating injuries, birth trauma, or iatrogenic injuries such as epidural steroid injection, lumbar puncture, and spinal surgery.⁵ Spinal manipulation is considered to be a safe therapeutic procedure and the incidence of complications has been estimated to be less than one injury for every 1 to 1.5 million adjustments.⁶ Cervical spinal manipulation is commonly used for the treatment of people with neck pain and

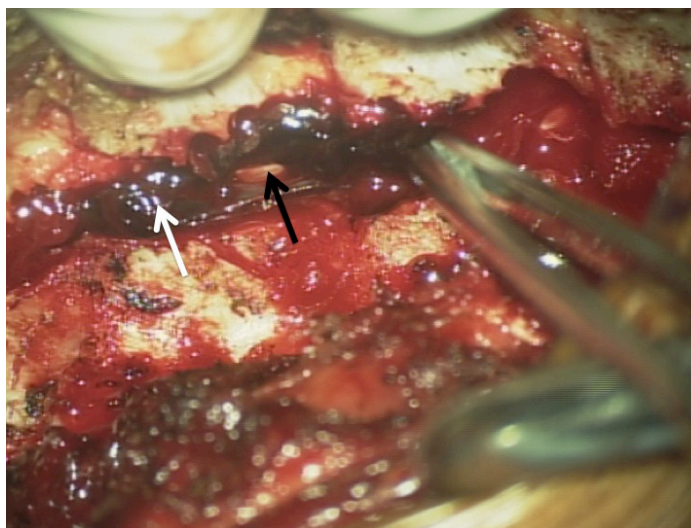


Figure 2. Intraoperative images revealed a dark blood clot (white arrow) at the dorsal aspect of the spinal canal, and compression of the spinal cord (dark arrow).

muscle-tension headache.⁷ Acute cervical SEH after spinal manipulation has been reported very rarely and only six cases have been described in the English literature (Table 1).^{4,5,8-11}

Bleeding from the epidural vein is the most widely accepted hypothesis for the mechanism of hematoma formation.^{1,12} Because primitive epidural veins do not have valves, any sudden rise in pressure such as during weight lifting or coughing may be transmitted directly to the epidural venous plexus thus causing bleeding and the formation of epidural hematoma.¹³ This could explain the usually slow progression of spinal cord compression symptoms. Because of the close fibrous adherence of the posterior longitudinal ligament on the ventral surface of the canal, all reported cervical SEH cases have occurred dorsally^{4,5,8-11}, including in the case presented here. The sudden increase in venous

pressure induced by foot pressure may have led to bleeding from the epidural veins and the formation of the hematoma in our patient.

The clinical presentation of SEH is severe pain and progressive neurological deficits including sensory, motor, or sphincter dysfunction.¹⁴ The symptoms of cervical SEH after spinal manipulation reported in the literature are similar (Table 1). Although these symptoms can vary depending on the size and location of the hematoma, almost all patients develop acute symptoms immediately after the manipulation.^{4,5,9-11} MRI is considered the gold standard modality for early diagnosis of SEH, with identification of the lesion and its effect on the spinal cord.^{1,2} MRI can also distinguish SEH from other conditions such as herniated vertebral disc, acute bony compression, cord edema, cord contusion, and subarachnoid hemorrhage.¹⁴

The treatment for SEH depends on the

Table 1: The summary of published cases with cervical spinal epidural hematoma after spinal manipulation in the English literatures, including our case.

Year	Author	Age	Gender	Symptoms	Time to onset of symptoms after manipulation	Level	Side	Treatment	Time to surgery after admission	Outcome
1989	Zuprunk and Mehta ⁸	86	Male	Weakness in right lower extremity and loss of light touch, pain and temperature sensation below C6 in left side extremities	1 day	C2-7	Right posterolateral aspect	Right hemilaminectomy, C3-5	Several hours	Good
1996	Segal <i>et al.</i> ⁵	33	Female	Weakness of left side extremities following tingling in bilateral extremities	15 minutes	C4-6	Left posterolateral aspect	Laminectomy, C4-6	3 days	Good
2002	Tseng <i>et al.</i> ⁴	67	Female	Weakness in left extremities and numbness in left arm following severe neck pain	Immediately	C3-5	Left posterolateral aspect	Laminectomy, C3-6	None reported	Good
2006	Whedon <i>et al.</i> ⁹	79	Male	Weakness of both lower extremities following numbness in feet	Immediately	C2-4	Right posterolateral aspect	Laminectomy, C4-5	Several hours	Good
2007	Domenicucci <i>et al.</i> ¹⁰	52	Female	Weakness in right leg following acute shoulder and back pain	Immediately	C3-T1	Right posterolateral aspect	Laminectomy, C3-T1	None reported	Good
2009	Heiner JD ¹¹	38	Female	Numbness and pain in neck and arms following several seconds of transient upper extremity paralysis and lower extremity numbness	Immediately	Foramen magnum to C4	Right posterolateral aspect	Conservative		Good
2015	Our case	16	Male	Weakness in right extremities following acute neck and right shoulder pain	5 minutes	C3-6	Right posterolateral aspect	Right open-door laminoplasty, C3-6	2 hours	Good

severity of neurological symptoms. Although conservative treatment has been proposed as a strategy to successfully treat patients with mild or no neurological symptoms, early surgical decompression is still the best choice of treatment for SHE.^{1,2} Most patients who underwent surgical evacuation of hematoma have improvement of neurological deficits, and better outcome of neurological deficits has been correlated with early surgery within 12 hours.¹⁵ In the published cases (Table 1), all patients demonstrated good outcome after treatment.^{4,5,8-11} Cervical laminectomy has been the most described surgical procedure for decompression of spinal cord in patients with cervical SHE.^{4,5,8-10} However, standard laminectomy has been reported to result in late cervical deformities including the formation of kyphosis and segmental instability.¹⁶ Because our patient was an adolescent male, we chose open-door laminoplasty to evacuate hematoma, decompress spinal cord, and avoid further late cervical deformities associated with cervical laminectomy. Our patient also had full recovery after the emergency decompression surgery.

In conclusion, although spinal manipulation is considered to be a safe procedure, acute cervical SEH can occur as a rare and devastating complication, even in a healthy adolescent. Early diagnosis and surgical intervention remains the keystone in the management of acute cervical SEH.

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