Case Report

Rapid and Spontaneous Resolution of Cervical Spinal Epidural Hematoma
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Summary
Although prompt evacuation of the hematoma is generally the first treatment option for symptomatic spinal epidural hematoma (SHE), rapid and spontaneous resolution of SEH in clinical and radiological findings is rarely observed. Here, we describe a case of post-traumatic cervical SEH that resolved within 19 hours, as observed by computed tomography (CT) and magnetic resonance imaging (MRI), without any surgical intervention. To the best of our knowledge, no case of spontaneous resolution of SEH within 1 day has been reported. This case presented here shows that immediate surgical intervention may not always be necessary for some post-traumatic SEH without neurological deficit. If conservative treatment of SEH is considered, it is critical to ensure adequate neurological observation and follow-up MRI, with the option of performing surgery at any time.

Key words: Spinal epidural hematoma, spontaneous resolution, conservative treatment

INTRODUCTION
Spinal epidural hematoma (SEH) is the accumulation of blood in the epidural space and can lead to mechanical compression of the spinal cord\(^1\). The majority of SEHs develop as postoperative complications or spontaneous lesions and are usually associated with coagulopathy or anticoagulation therapy\(^{6,15}\). Post-traumatic SEH is relatively rare\(^1\).

Although the exact incidence rate of post-traumatic SEH has not yet been determined, this SEH accounts for 0.5% to 1.7% of all spinal injuries\(^3\). Prompt evacuation of the hematoma is generally the first treatment option for symptomatic SEH, because symptom duration and initial neurological state are associated with a favorable outcome\(^{1,5,8,12}\). Rapid and spontaneous resolution of SEH in clinical and radiological findings is rarely
observed. Although some reports on success of conservative treatment for SEH are available, early, spontaneous resolution of SEH is extremely uncommon and, to the best of our knowledge, no case of spontaneous resolution of SEH within 1 day has been reported. Here, we describe a case of post-traumatic cervical SEH that resolved within 19 hours, as observed by radiological images, without any surgical intervention, and we review the literature on this rare phenomenon.

CASE PRESENTATION

An 81-year-old woman presented with headache and neck pain after a pedestrian traffic accident; the patient lost consciousness for a few minutes after the accident. Plain radiographs of the cervical spine were unremarkable. The initial neurological examination showed normal strength (5/5) in all extremities and joints, with tenderness in the cervical spine. A laboratory evaluation showed an activated partial thromboplastin time of 25.1 sec (normal range, 23–35 sec), a prothrombin time of 110.9% (70–120%), an international normalization ratio of 0.93 (0.9–1.25), and a platelet count of 187,000 platelets/μL (150,000–450,000 platelets/μL). The patient had not received any medication to impair hemostasis or platelet function. Computed tomography (CT) of the cervical spine showed fusiform, high-density lesions along the posterior epidural space between the C3/4 and C7/T1 levels with compression of the dural sac, suggesting the possibility of acute cervical SEH (Figure 1). We recommended decompressive surgery, but the patient and the patient's family rejected the recommendation due to her old age. Because the patient's neurological examination revealed no neurological deficit, we did not insist on surgery. However, cervical magnetic resonance imaging (MRI) performed 19 hours after the initial CT scan showed nearly complete resolution of the SHE without abnormal enhancement within spinal canal (Figure 2). The patient's condition continued to improve, and her pain gradually decreased; she was discharged after 10 days with no neurological deficits.

Figure 1: Sagittal (A), axial (B) and coronal (C) cervical spinal computed tomographic image showing fusiform, high-density lesions along the posterior epidural space from C3/4 to C7/T1 levels with compression of the dural sac; this suggested acute spinal epidural hematoma (asterisk).
DISCUSSION

Many causes of SEH have been described, such as coagulopathy, trauma, surgery, and vascular lesions (1,8). Most hematomas occur spontaneously with no known cause; however, some spontaneous lesions are associated with vascular anomalies such as arteriovenous malformations, vertebral hemangiomas, obstetrical birth trauma, lumbar punctures, spinal manipulations, and epidural procedures (1,3,6,7,10,13,15). The precise incidence of post-traumatic SEH has not been determined. The traumatic causes of SEH reported in the literature include spinal manipulation therapy, obstetrical birth trauma, lumbar punctures, postoperative bleeding, epidural anesthesia, missile injury, falls from heights of 3 to 20 feet, falls from standing, motor vehicle accidents, being struck in the back by objects, and vertebral fractures resulting from blunt trauma (1,3,4,13,15).

The pathogenesis of post-traumatic SEH is not completely understood. In the literature, 3 mechanisms for the development of post-traumatic SEH have been discussed: rupture of epidural veins, rupture of epidural arteries, and hemorrhage resulting from vascular anomalies (7,17). Some authors have indicated that post-traumatic SEH may develop due to bleeding after rupturing of the spinal epidural artery, which results from a sudden stretching of these vessels (1). The most common source of bleeding is the venous plexus in the epidural space. The venous plexus is composed of thin valveless vessels and may, therefore, be vulnerable to rupturing after abrupt changes in venous pressure, which could result from blunt trauma (1,3). In post-traumatic SEH resulting from arterial rupture, bleeding originates in the root zone, and the patient often experiences radicular pain during the early stage of the post-traumatic SEH (9). On the other hand, post-traumatic SEH resulting from the spinal epidural venous plexus is usually located posterior to the dural sac, which is consistent with the anatomical location of the venous plexus. Kou et al. suggested that multilevel procedures increase the risk of rupturing of this venous plexus, thereby
escalating the possibility of compressive hematoma\(^{(5)}\).

Some cases of spontaneous resolution of traumatic cervical SHE have been reported in the literature. Kim et al. reported traumatic mid-cervical SEH of a 45-year-old man with weakness of the left extremities\(^{(5)}\). They recommended the surgical evacuation, but the patient refused operation. The patient showed clinical improvement on the second day. The follow-up MRI on the third day showed that the majority of hematoma had disappeared. Jang et al. presented spontaneous resolution of a traumatic cervicothoracic SEH presenting with transient paraplegia in a 50-year-old man\(^{(5)}\). Surgery of the patient was delayed because his neurological symptoms improved. The follow-up MRI at 12 days after the event showed complete resolution of the SEH. Rechtine et al. described the case of a 35-year-old man in whom a symptomatic cervical epidural hematoma developed after trauma\(^{(12)}\). MRI revealed a large SEH, which extended from the 4th to the 7th cervical segment. Because of the improvement in the neurological findings, no operation was performed. The follow-up MRI at 15 days after the showed complete resolution of the SEH. Although the underlying mechanism of the rapid resolution of SEH is still unclear, Jang et al. proposed that rapid absorption of the hematoma through the epidural fatty areolar tissue might be responsible for spontaneous improvement\(^{(5)}\); the fatty areolar tissue of the epidural space contains a vast capillary network that facilitates rapid absorption\(^{(4,9)}\). Anatomically, epidural fatty tissue and venous plexus are more abundant on the dorsal side of the spinal canal than on the ventral side\(^{(4)}\). The close fibrous adherence of the posterior longitudinal ligament on the ventral surface of the canal may be responsible for this anatomical preference\(^{(2,3,15)}\). The post-traumatic SEH described here may have resolved rapidly due to absorption by the epidural areolar tissue.

SEH usually presents with acute, severe pain in the location of the hemorrhage with radiation of pain to the extremities\(^{(7)}\). Most patients develop sensory and motor deficits within minutes to hours of the injury and eventually develop complete paralysis\(^{(2,9)}\). Our patient showed no symptoms or signs of SEH, except neck pain. Recently, the number of patients who undergo cervical CT scans following minor injuries has markedly increased, resulting in an increase in the proportion of SEH detected in patients who are conscious and neurologically intact or show minimal symptoms. The most consistently reported treatment of symptomatic SEH in medically stable patients is decompressive surgery of the compressive lesions\(^{(1)}\). Surgery is undoubtedly the treatment of choice for patients with SEH and neurological deficit\(^{(7)}\). Approximately 50% of the surgically managed symptomatic SEH patients show full neurological recovery\(^{(1)}\). Most authors agree that surgical decompression for symptomatic SEHs must be performed as soon as possible, but controversy exists regarding whether to perform emergency or urgent surgery\(^{(1)}\). Although many studies suggest that the spontaneous resolution of hematoma is extremely rare\(^{(4,10)}\), several cases that have shown favorable outcomes after conservative treatment have been reported\(^{(4,5,9,11,12)}\). Mild symptoms can resolve spontaneously; however, resolution of neurological deficits may be facilitated by urgent decompressive surgery performed within hours of the onset of symptoms. This case presented here shows that immediate surgical intervention may not always be necessary for some post-traumatic SEH without neurological deficit. Operative versus non-operative management should be determined by the Neurosurgery Department on the basis of the severity of the neurological deficits as well as the stability, progression, and improvement of these deficits over time.
CONCLUSION

This case report is important as it demonstrates the rapid resolution of post-traumatic cervical SEH within 19 hours without operation, as assessed with imaging techniques; however, the exact underlying mechanism remains unclear. The reported incidence of SEH without neurological deficits might increase with advances in imaging techniques such as CT and MRI and increased availability of these techniques. Patients with suspected SEH should be promptly evaluated by CT or MRI. For cases in which neurological symptoms are not severe and symptom progression has not occurred, conservative management with careful observation is an alternative treatment option. If conservative treatment of SEH is considered, it is critical to ensure adequate neurological observation and follow-up MRI, with the option of performing surgery at any time. Further clinical studies should be conducted to obtain more precise data.

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