CASE REPORT

Traumatic subdural hematoma in the lumbar spine

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KEYWORDS
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Abstract
Traumatic spinal subdural hematoma is rare and its mechanism remains unclear. This intervention describes a patient with mental retardation who was suffering from back pain and progressive weakness of the lower limbs following a traffic accident. Magnetic resonance imaging of the spine revealed a lumbar subdural lesion. Hematoma was identified in the spinal subdural space during an operation. The muscle power of both lower limbs recovered to normal after surgery. The isolated traumatic spinal subdural hematoma was not associated with intracranial subdural hemorrhage. A spinal subdural hematoma should be considered in the differential diagnosis of spinal cord compression, especially for patients who have sustained spinal trauma. Emergency surgical decompression is usually the optimal treatment for a spinal subdural hematoma with acute deterioration and severe neurological deficits.

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Introduction

Spinal trauma often results in vertebral fracture because the vertebral bodies absorb the force loading on the spine [1]. Traumatic spinal hematomas are most commonly epidural, with more than 200 cases reported [2]. Vertebral fractures associated with traumatic spinal epidural hematoma have been reported in patients following high-energy trauma. The most likely etiologies are bleeding from a broken bone surface or injured epidural veins [3]. The internal vertebral venous plexus lies in the spinal epidural space; however, the spinal subdural space is almost avascular. Trauma leading to spinal subdural hematoma is rare with only nine cases reported in literature [4]. Concomitant intracranial and spinal subdural hematomas were identified in five of the nine patients. In other four cases, three patients had chronic spinal subdural hematomas before the era of computed tomography (CT) scanning. Chronic thoracic spinal subdural hematoma was identified in one patient who was suffering from severe throbbing frontal headache and chronic spinal subdural hematomas were identified in two patients who also had history of lumbar puncture. An acute thoracic spinal subdural hematoma was identified in one patient who sustained progressive headache and drowsy consciousness without obtaining CT of the brain. In the above four cases, myelography revealed filling defect over the spinal lesions in three cases and magnetic resonance imaging (MRI) of thoracic spine showed...
hyperintense lesion on T1- and T2-weighted images in one case. Three of the four patients received surgery and spinal subdural hematomas were proved; one patient received conservative treatment because he recovered from neurological deficits 2 months later. The authors concluded that intracranial hemorrhage could not be ruled out in two cases and mechanism of spinal subdural hematoma may be associated with intracranial events [4]. To our knowledge, purely traumatic spinal subdural hematoma without brain injury has not been reported.

Domenicucci et al. [5] reviewed 106 cases of non-traumatic acute subdural spinal hematoma. They determined that in 57 cases, hematomas were associated with bleeding disorders, which were secondary to hemostatic defect in 20 cases and to anticoagulant therapy in 37 cases. Lumbar puncture and spinal surgery acted as an iatrogenic cause in 53 cases. In another 17 cases, hematomas were attributable to unusual conditions—rupture of an arteriovenous malformation, harbored an intradural tumor, and history of ventriculoperitoneal shunt. In the remaining 36 cases, hematomas occurred spontaneously in the absence of the above risk factors. The etiologies of nontraumatic spinal subdural hematoma differ from that of traumatic spinal subdural hematoma. Nontraumatic spinal subdural hematoma is related to spontaneous or iatrogenic causes. Spontaneous nontraumatic spinal subdural hematoma may be caused by coagulation abnormalities associated with blood dyscrasia or anticoagulation. Iatrogenic effects, such as those caused by a lumbar puncture that is performed for diagnostic or anesthetic reasons, or even ventriculoperitoneal shunt surgery or craniectomy, can result in spinal subdural hematoma. Traumatic spinal subdural hematoma in reported cases is associated with previous injuries, including intracranial hemorrhage or spinal trauma [6–8].

Traumatic spinal subdural hematomas are markedly rarer than intracranial subdural hematomas. The intracranial subdural space is easily occupied by a hematoma when the brain suffers a severe contusion leading to the rupture of vessels. Unlike the intracranial subdural space, no bridging vessels run in the spinal subdural space [9]. Bortolotti et al. [6] hypothesized that traumatic spinal subdural hematoma may be migrated from an intracranial subdural hemorrhage. This article presents a purely traumatic spinal subdural hematoma occurring without intracranial subdural hematoma.

Case presentation

A 38-year-old male sustained severe lower back pain because of an autopedestrian injury. He was brought to the division of neurosurgery because he was unable to walk 3 days after the injury. The patient was mentally retarded and could not describe in detail how he was hit by a car. The patient had no other presentations, denied anticoagulant therapy, and denied lumbar puncture. No family history of hematologic disease existed. Physical examination revealed tenderness over the lumbosacral region. Neurologically, manual muscle testing showed that muscle power was Grade 2 in both lower limbs.

Plain radiographs of the lumbar spine showed no obvious deformity of vertebral bodies. Blood tests revealed a normal platelet count (291 × 10^3/μL). Coagulation parameters were normal, including prothrombin time of 11.0 seconds, international normalized ratio of 1.00, and activated partial thromboplastin time of 26.8 seconds. Level of serum electrolytes and glucose were also within normal limits. On the same day, the patient was admitted to a hospital ward for further assessment.

According to the above findings, an intraspinal hematoma or tumor was suspected. Sagittal T2-weighted MRI of the lumbosacral spine showed an isointense lesion over the anterior aspect of the subdural space at the L4–S2 levels (Fig. 1). Axial MRI of the lumbosacral spine at the L5 level revealed an intrathecal extramedullary lesion with hyperintensity on T1-weighted images and isointensity on T2-weighted images (Fig. 2). After intravenous injection of gadolinium, the lesion was not enhanced on axial T1-weighted images. Based on available images, a spinal subdural hematoma was first considered. The relatively less common differential diagnosis of tumor growth or metastasis was considered.

Urgent surgery via a L4–L5 laminectomy and removal of lesion were performed in response to motor deficits. Although the epidural space had no obvious abnormalities, the dura mater was bluish in color and tended to bulge. Opening the dura revealed a hematoma, which was
removed completely with suction and tumor forceps (Fig. 3). No active bledders were noted in the spinal subdural space. Nerve roots appeared free and their courses were normal after the hematoma was removed.

The patient experienced immediate pain relief after 2 days postoperatively. Motor function of the lower limbs gradually returned and the patient was able to walk with assistance 5 days after surgery. The patient was discharged without neurological deficits after 11 days postoperatively. At 6-month follow-up, the motor deficits had disappeared entirely.

Discussion

In our present case, the patient sustained a major spinal trauma that resulted in back pain and paraplegia. There was neither headache nor conscious change in the case. The patient denied history of lumbar puncture and hemorrhagic disorder. He was mentally retarded and could not effectively describe how he was injured. The authors assumed that the patient was hit by a car and rolled on the ground. The vertebra sustained a rotational force; the sharp and shearing efforts may have twisted the spinal canal, resulting in tearing of the small vessels and dura. Progressive paraplegia developed at 3 days after the accident. Bleeding from the vessels and accumulation of a considerable volume in the subdural space required time. The small amount of blood may not have compressed the nerve roots; however, a hematoma formed, eventually resulting in cauda equina syndrome.

The pathogenesis of a spinal subdural hematoma remains controversial because the spinal subdural space is generally avascular. Three cases of traumatic concomitant intracranial and spinal subdural hematoma have been reported (Table 1) [6–8]. The formation of a hematoma is presumed to have migrated from an intracranial subdural hemorrhage. The authors speculate that a rotational force impacting the spine resulted in a purely traumatic spinal subdural hematoma without intracranial subdural hematoma.

Early surgical treatment can improve the outcomes for spinal subdural hematoma when patients’ neurological status deteriorates progressively [10,11]. Leber et al. [12] reviewed cases that achieved 80% improvement in neurological function after surgery. Surgical treatment, consisting of laminectomy and evacuation of the hematoma, should be performed as soon as possible when spinal cord damage leads to an unstable neurological condition [13]. However, spontaneous remission is recommended for patients with no or minimal neurological deficits [14].

A spinal subdural hematoma should be considered in differential diagnosis of spinal cord compression, especially for patients who have sustained spinal trauma. An X-ray of the spine can identify vertebral fracture and CT scan of the brain can exclude an intracranial hematoma. Notably, MRI is the most important tool for distinguishing between spinal subdural hematomas and other spinal lesions when motor deficits develop rapidly. Emergency surgical decompression is generally the best treatment for a spinal subdural

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Figure 2. Preoperative axial T1- and T2-weighted magnetic resonance imaging of the lumbosacral spine at the L5 level. (A) Intrathecal extramedullary lesion with hyperintensity on T1-weighted image (black arrow). (B) Lesion with isointensity on T2-weighted image (white arrow).

Figure 3. After opening the dura and separating the nerve roots, the hematoma (white arrow) was identified.
hematoma with acute deterioration and severe neurological deficits.

References