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CASE REPORT

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Spinal subdural hematoma

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Abstract We report the case of a 68-year-old patient with a traumatic spinal subdural hematoma. MRI demonstrated an area of abnormal intensity and a black line in the inner part of the intradural space. We anticipate that MRI will help to make one more confident in the preoperative diagnosis of spinal subdural hematoma. The symptoms completely disappeared immediately after the operation. Spinal subdural hematoma requires immediate surgical evacuation. The prognosis for functional recovery is good if the condition is appropriately diagnosed and treated before development of irreversible paralysis. We recom-mend MRI to make an early diagnos-is and early evacuation of spinal subdural hematoma.

Key words Spine · Spinal subdural hematoma · Magnetic resonance imaging

Introduction

Spinal subdural hematoma is rare, and only a few cases have been reported. We report a patient who developed a thoracic and lumbosacral spinal subdural hematoma following trauma.

Case report

A 68-year-old patient was referred to us in November 1993 for treatment of low back pain, bilateral posterior thigh pain and bladder dysfunction, which had been present for 1 month. The patient had fallen in a gymnasium and had sustained a head injury. A small intracranial chronic subdural hematoma identified by a neurosurgeon had been treated conservatively. The patient was not on anticoagulant therapy. Beginning 2 weeks after the accident, the patient noted intermittent low back pain, which continued for 2–3 min. Although these symptoms increased, muscle power and sensory function were intact.

Plain radiographs of the spine did not reveal any abnormalities. The sagittal MR image (MRI; 1.5 T) of the lumbar spine disclosed an area of high signal intensity in the intradural space from the T12 vertebral level to the sacrum on both spin-echo T1-weighted (Fig. 1A) and gradient echo T2*-weighted images (Fig. 1B). A longitudinal black line was observed between the cauda equina and an abnormal signal area (Fig. 1A, B). An abnormal signal and a black line were also observed at the thoracic spine from T5 to T11/12 (Fig. 2A, B). On the transverse scans, the abnormal signal was located at the posterior site of the cauda equina, and its shape differed with the scan level (Fig. 3A, B).

An emergency operation was performed because of uncontrollable low back pain suggesting an epidural hematoma or abscess. First, a decompressive lumbar laminectomy was performed from L1 to L3. The lumbar epidural space was found to be normal, but the dural tube was pulseless and darkly discolored (Fig. 4A). When the dura was opened, about 10 ml of dark liquid blood was evacuated (Fig. 4B). The arachnoid seemed normal and subarachnoid fluid pulsation was noted after removal of the subdural hematoma. A thoracic laminectomy was then performed from T8 to T9. Although the dura matter was discolored, the subdural hematoma had already been evacuated by the lumbar procedure. These findings confirmed that the thoracic and lumbar subdural hematomas were connected. The symptoms completely disappeared immediately after the operation. On the

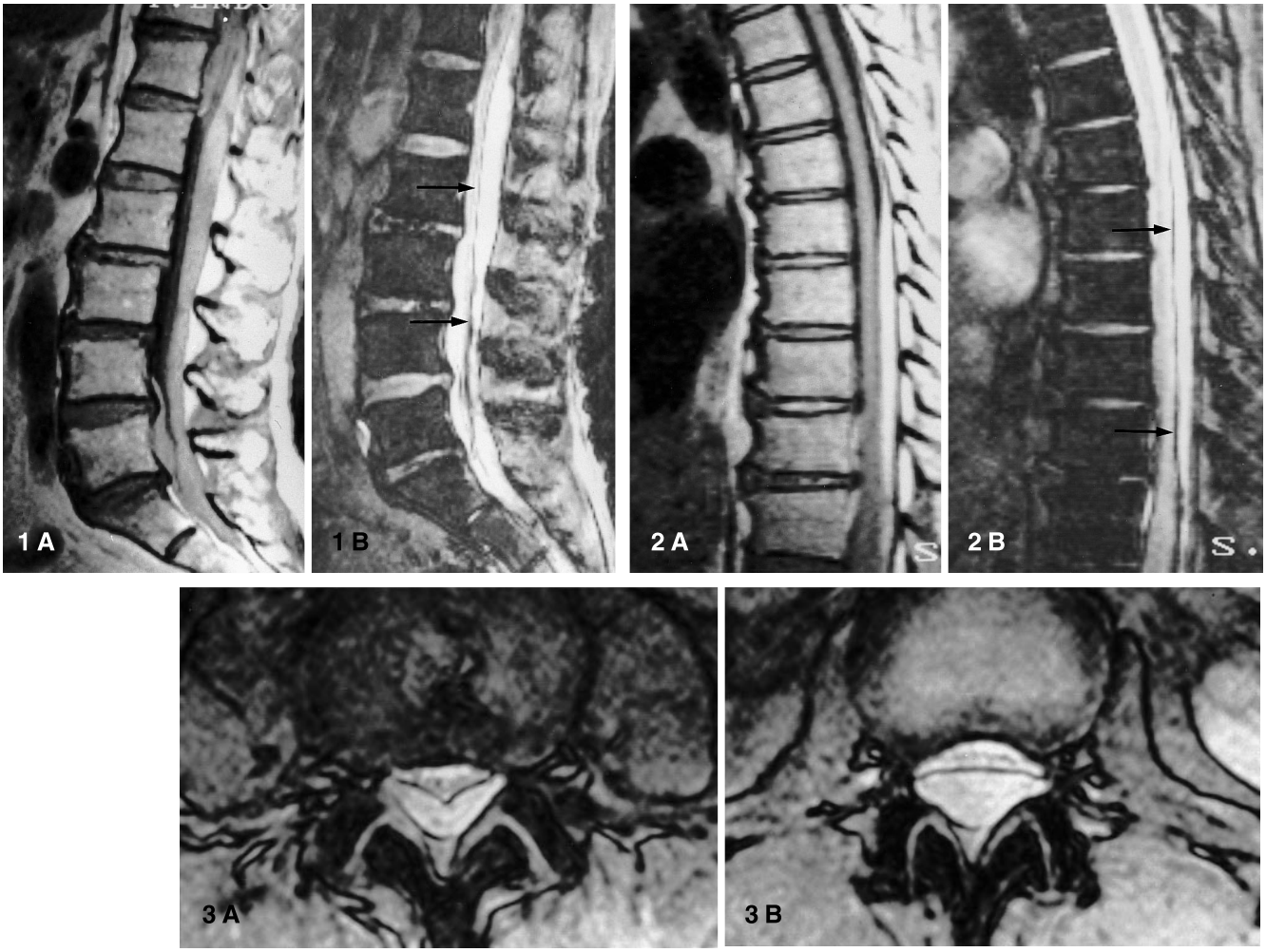

Fig. 1A, B The sagittal scans of MRI of the lumbar spine disclosed an area of high signal intensity in the intradural space from the T12 vertebral level to the sacrum on both spin echo T1-weighted image (TR/TE=500/20 ms) (**A**) and gradient echo T2*-weighted image (TR/TE=400/34 ms) (**B**). A longitudinal black line (*arrow*) was observed between the cauda equina and an abnormal signal area

Fig. 2A, B An abnormal signal and a black line (*arrow*) were also observed at the thoracic spine from T5 to T11–12 (spin echo T1-weighted image: TR/TE=500/20 ms, gradient echo T2*-weighted image: TR/TE=400/34 ms)

Fig. 3A, B On the transverse scans, the abnormal signal is located at the posterior site of the cauda equina, and its shape differs with the scan level (gradient echo T2*-weighted image: TR/TE=300/22 ms)

postoperative MR images, no abnormal signal area or black line was noted (Fig. 5A, B).

Discussion

A spinal subdural hematoma is an uncommon entity, which is usually diagnosed at operation or postmortem examination because it lacks a typical clinical or radiographic character. The myelography and CT scan features have been described in the literature. The present report describing characteristic MR image findings might be the first such report on spinal subdural hematomas.

In 1948, Schiller et al. [1] published what has generally been considered the first report on a spinal subdural hematoma in a hemophiliac infant who became paraplegic after lumbar puncture. Since then, 66 cases have been reported. Russell et al. [2] surveyed the literature regarding 58 cases of spinal subdural hematoma, 50 of which were described in detail. The female-to-male ratio (47 cases) was 2.1:1, and the age ranged from 4 months to 80 years (average 41 years). The hematomas were most commonly found in the sixth decade, as in our patient, and located at the thoracic (22.2% of 45 cases) and thoracolumbar regions (35.6%). In five cases (11.1%), the clot was found to extend from the thoracic to the sacral region, as in our patient. Coagulation abnormalities caused by either blood dyscrasia [1, 3, 4] or anticoagulant therapy [5–7] were considered factors precipitating hemorrhage in 21 (36.8%)

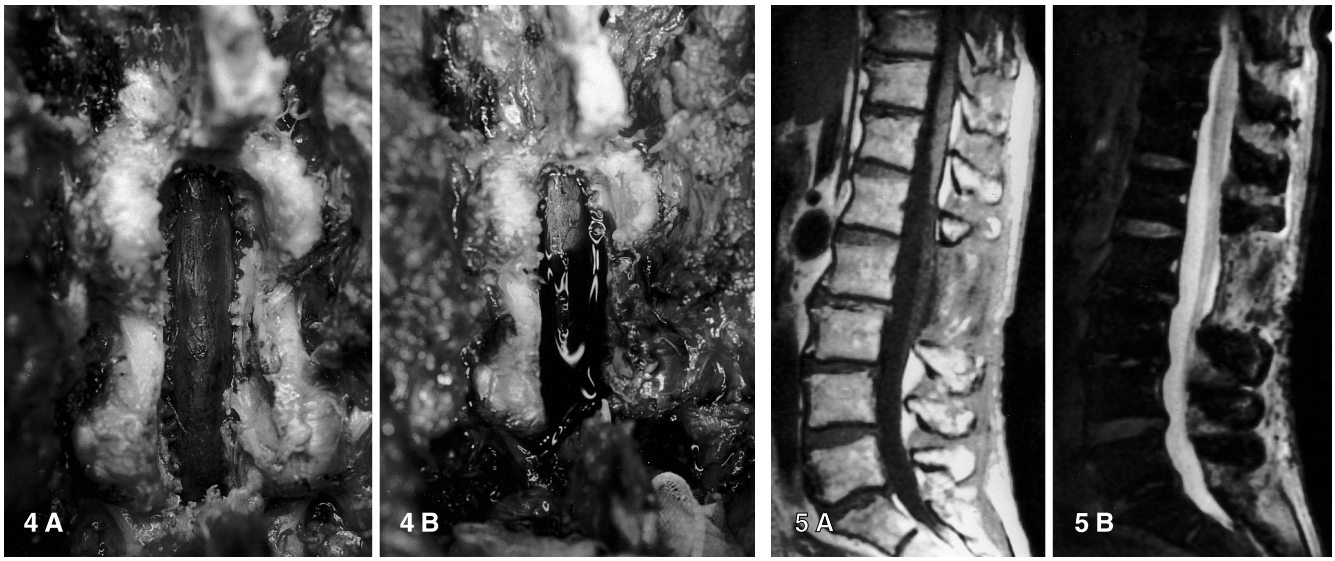

Fig. 4A, B Findings at operation. **A** The dura tube was pulseless and darkly discolored. **B** When the dura was opened, 10 ml of dark liquid blood was evacuated

Fig. 5A, B In the postoperative MR images, no abnormal signal area or black line was noted (spin echo T1-weighted image: TR/TE=500/20 ms, gradient echo T2*-weighted image: TR/TE=400/34 ms)

of 57 cases. The other related factors were lumbar puncture in 8 cases (14.0%) [1, 3, 4, 8], minor trauma in 9 [15.8%], major trauma in 10 (17.5%) [9–11], arteriovenous malformation in 2 (3.5%) [12], and spinal surgery in 2 (3.5%) [13]. Spontaneous hematoma was observed in the remaining 5 cases (8.8%). Fujino et al. [14] surveyed 10 cases (8 males and 2 females) of traumatic spinal subdural hematoma reported in the literature [1, 10, 11, 15–20]. Their ages ranged from 1.4 to 77 years (average 32.9 years). The anatomic location was the thoracic spine in 4 cases, and the thoracolumbar, lumbar, and cervical spine in 2 cases each. The history of trauma included a fall in 8 cases, an automobile accident in 1, and was unclear in 1.

Severe back pain followed by radicular pain in the arms, legs, or trunk was frequently an initial complaint in the patients with spinal subdural hematoma. The neurological features before operation as surveyed by Russell et al. [2] were paraplegia in 30 (71%) of 42 cases, major paresis in 9 (21.4%), and minor paresis in 3 (7.1%).

Although myelography has consistently been reported to be a useful examination for spinal subdural hematoma, Russell et al. [2] described that lumbar puncture was dry and difficult in 12 (31.6%) of 38 patients because of a clot. Although a total block was demonstrated on myelograms in 20 (52.6%) patients and a partial block in 6 (15.8%), it was not possible to diagnose a spinal subdural hematoma. Fujino et al. [14] described one traumatic case diagnosed by CT scan in which it was impossible to determine whether the hematoma was located in the intradural or extradural space. In this case, MRI demonstrated an area of abnormal intensity and a black line in the inner part of the intradural space. Since spinal epidural hematomas usually lay in the dorsal epidural space, the dura mater is visible irregularly on MRI [21]. On the other hand, the shape of dura mater on MRI is smooth in spinal subdural hematoma. The operative findings in spinal subdural hematoma correspond to the duration of symptoms and the evolution of the clinical syndrome [2]. In acute cases, the clot shows variable volume, but is semiliquid and dark red. It is easily removed by suction and irrigation. In subacute cases, the clot has organized to some degree. In chronic cases, a well-defined membrane enclosing a fluid-filled cavity is found. The signal intensity of spinal subdural hematomas shown on MRI also depends on the duration. The black line between the spinal cord and the abnormal signal area is the edematous arachnoid. The shape of the hematoma on transverse-view MRI is variable and depends on the interface between the dura and arachnoid. The anatomical relationship of the dura to the arachnoid was disputed for many years until microsurgical procedures revealed multiple, fine reticular attachments between the dura and arachnoid. Some disease processes originally thought to occur in a subdural space are now thought to occur in a cleavage plane within the inner-most layer of cells of the dura (what are termed “dural border cells” [22]. We anticipate that MRI will contribute to greater confidence in the preoperative diagnosis of spinal subdural hematoma.

Manelfe [23] has demonstrated an anastomosing network of extremely delicate vessels directed longitudinally along the lateral margins of the undersurface of the dura matter; they are, however, not likely to be sources of hemorrhage because of their small size. Rader [15] has proposed that a

spinal subdural hematoma results from an indirect force on the intraspinal vessels. A sudden increase in abdominal and thoracic pressures elevates the intravascular pressure in the spinal subdural and subarachnoid spaces. This force would not be neutralized by a simultaneous increase in spinal fluid pressure because of the shielding effect of the spinal column and its ligaments. Such a momentary disparity between intravascular and extravascular pressures could result in rupture of a spinal vessel.

Thirty-six patients were treated by laminectomy and clot evacuation. While 10 patients showed completely recovery and 6 incomplete recovery after the surgical treatment, 20 showed no recovery. Fujino et al. [14] reported that decompressive lumbar laminectomy was performed in all 10 traumatic cases. Postoperatively, only 1 patient recovered completely and 3 incompletely, and 6 showed no recovery.

Spinal subdural hematoma necessitates an immediate surgical evacuation. The prognosis for functional recovery is good if the condition is appropriately diagnosed and treated before development of irreversible paralysis. We recommend MRI as useful in early diagnosis and early evacuation of spinal subdural hematoma.

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