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Case Report

Nonsurgical treatment of an upper thoracic spinal subdural hemorrhage

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Study design: A case report of an upper thoracic spinal subdural hemorrhage which was managed successfully by conservative treatment.
Objectives: Spinal subdural hemorrhage is rare and can cause serious neurologic symptoms. Surgery is the most common treatment and is believed to prevent further neurologic injury. A case of an upper thoracic spinal subdural hemorrhage which was managed successfully by conservative therapy is reported.
Setting: Department of Orthopaedic Surgery, Tokai University School of Medicine, Isehara, Japan.
Methods: A 29-year-old woman presented with acute severe back pain. She experienced acutely developed weakness of both lower extremities, hypesthesia below T6 and urinary retention. Magnetic resonance imaging performed on the day of hospital admission revealed the existence of a subdural hematoma in the upper thoracic spine. Muscle strength of the lower extremities was grade 0 on admission, but improved slightly on day 1. The decision was made to manage the patient nonoperatively by corticosteroid and diuretic administration.
Results: Improvement was gradual but progressive. Muscle strength was grade 4 out of 5 on the 28th day. Magnetic resonance imaging at 3 months except for mild urinary retention.
Conclusions: Spinal subdural hemorrhage can be treated nonoperatively by correlating magnetic resonance image findings with the clinical condition.
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Keywords: conservative therapy; spinal subdural hemorrhage; spinal paralysis

Introduction

Spinal subdural hemorrhage (SSH) is rare (especially if observed at an upper thoracic level), and can cause serious neurologic symptoms. Most cases have been treated by surgical intervention to minimize the risk of permanent neurologic injury. A search in Medline yielded only five cases during 30 years which reported successful conservative treatment for SSH. We pose some criteria of the conservative treatment for SSH, and we believe that SSH can be treated nonoperatively in selected cases by correlating magnetic resonance image findings with clinical condition.

Case report

A 29-year-old woman presented to a clinic complaining of severe neck pain, headache, and nausea which had persisted for 6 days. No precipitating event was identified, and the pain did not respond to over-the-counter analgesics. During the physical examination, the patient developed acute muscle weakness of both lower extremities and became unable to walk. She was transferred to University Hospital that day. No anticoagulant agent had been administered at that time.

On initial physical examination at our facility, muscle strength of the lower extremities was grade 0 out of 5. Deep tendon reflexes (DTRs) were hyperactive in both upper and lower extremities. Babinski reflex and Chaddock reflex were present. The patient was hypesthesic below the level of T6, more on the right than the left, and she was unable to void. Routine laboratory data were unremarkable, except for a slight elevation in the white blood cell count and C-reactive protein concentration.

The initial plain spinal radiographs revealed no abnormality such as destruction of the bony elements. However, thoracic spinal magnetic resonance image (MRI) revealed an intradural extramedullar hematoma of the dorsal aspect of spinal cord from T1 to T4. The hematoma was isodensity on T1-weighted images and

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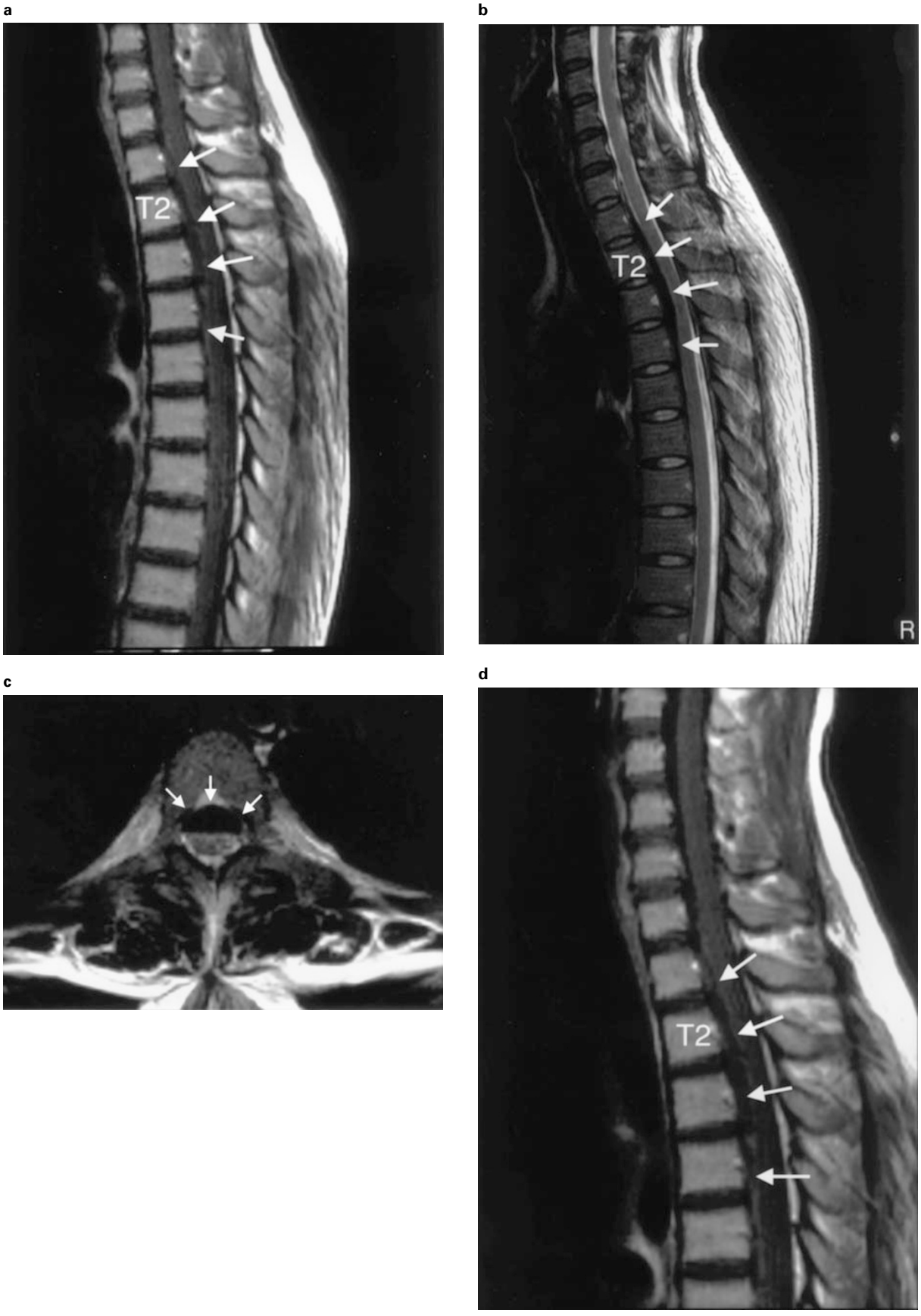

Figure 1 Initial MRI, revealing an intradural extramedullar hematoma of the dorsal aspect of spinal cord from T1 to T4. (**a**) T1W1, Sagittal plane. (**b**) T2W1, Sagittal plane. (**c**) T2W1, Axial plane. (**d**) T1W1, Enhanced by Gd-DTPA

hypointensity on T2-weighted images, it was not enhanced by Gd-DTPA (Figure 1).

We diagnosed an upper thoracic spinal subdural hemorrhage (SSH). Angiography was performed, but no additional pathology, such as a vascular malformation, was demonstrated. Digital subtraction angiography (DSA) was confirmatory.

Spinal edema was treated by the administration of methylpredonisolone sodium succinate, 2500 mg on day 1 and 1500 mg on day 2, and concentrated glycerin, 800 mg was given each day. The homostatic agents, carbazochrome sodium sulfate, 25 mg and tranexamic acid, 1000 mg were also administrated on day 2.

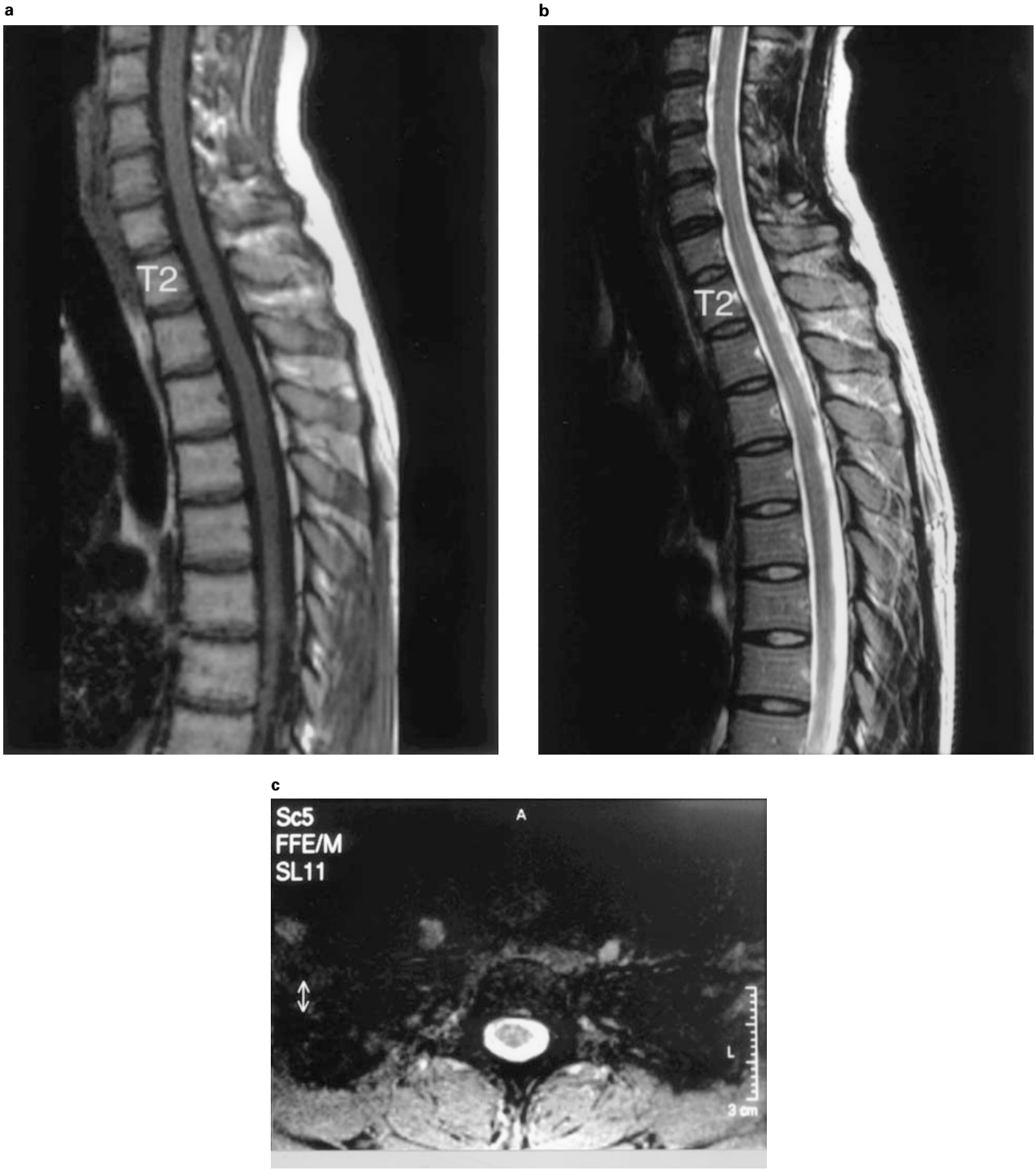

Figure 2 MRI 3 months after the onset, revealing a complete resolution of SSH. (**a**) T1W1, Sagittal plane. (**b**) T2W1, Sagittal plane. (**c**) T2W1, Axial plane

Follow-up MRI, performed on day 10, showed an expansion of the hematoma, which appeared as mixed intensity on T2-weighted images. There appeared to have been rebleeding from the paraspinal vessels, but physical examination was unchanged. Thereafter, serial MRI confirmed resorption of the hematoma without further hemorrhage.

The initial recovery of muscle strength of bilateral lower extremities was observed on day 1. The patient improved gradually, and muscle strength was grade 4 on day 28. Sensory impairment had not resolved, and the patient still required intermittent catheterization, although urinary retention had improved. By day 46, the patient was able to walk with a walking frame. Her urinary retention had almost resolved, and the level of hypesthesia was T8 rather than T6. The MRI, obtained at 3 months after the onset of symptoms, showed virtually complete resolution of the SSH (Figure 2). Muscle strength of both lower extremities was grade 5 at 2 years and 6 months, and the hypesthesia was completely resolved. Mild urinary retention persisted, but there was no need for intermittent catheterization and the patient was able to return to their normal work.

Discussion

The differential diagnosis of hemorrhage as the case of spinal paralysis includes epidural hemorrhage, subdural hemorrhage and intraspinal hemorrhage. Except for peak age, the demographics and clinical characteristics of the three are indistinguishable.[2,5,7,10] In the present case, angiography did not detect the source of the bleeding. Typically, the source of the bleeding is not identified precisely.

SSH is rare compared to intracranial subdural hematoma and is likely to occur at a lower thoracic level rather than in the upper thoracic region. The etiology of SSH includes trauma, spontaneous bleeding due to hematologic disorder, vascular malformation, toxemia of pregnancy, tumor, lumbar puncture, anticoagulant therapy, spinal surgery, and idiopathic SSH.

Most cases are treated by surgical decompression of the spinal cord, evacuation of the hematoma and ligation of feeding arteries.[1,3,4,13,14] Most reports recommended urgent intervention to minimize the risk of permanent neurologic injury.

In making a strategy for treating SSH, we rapidly need to identify its etiology, evaluate the damage to the spinal cord, and presume the further neurological deficit which may occur in succession. In the case we can identify, its etiology and rapid progression of symptoms are observed, we never hesitated to stop the bleeding and decompress the spinal cord surgically. If we miss the opportunity of surgical intervention, permanent neurological deficits are inevitable. On the other hand, surgical intervention may increase the risk of iatrogenic spinal cord injury, or excessive bleeding especially in those patients who have a hematologic disorder and are receiving anticoagulant therapy. Therefore, we have to be careful to determine when to treat surgically unless the source of bleeding is detected.

Only six cases of conservatively managed SSH have been reported during the last 30 years, including the present case (Table 1).[6,8,9,11,12] In all nonsurgically managed cases, the initial severity of neurologic symptoms was grade D or E on the Frankel grading scale, or improvement was noted within 2 or 3 days. Based on our experience and on published reports, we conclude that surgery is not essential in all cases of SSH. We believe that conservative management may be indicated when: (a) symptoms improve quickly during the acute phase with treatment of spinal edema, and (b) the severity of neurologic symptom initially is grade D or better on the Frankel grading scale.

When at least one criterion of two is satisfied, it is worthwhile to attempt nonsurgical management in combination with close clinical observation and serial MRI.

Deterioration of the clinical condition or evidence of hematoma expansion is an indication that the conservative approach should be abandoned.

Conclusion

Although many cases of SSH require surgery, conservative management may be attempted in selected

Table 1 Published Case Reports of spinal subdural hematoma managed nonoperatively

Year	*Author*	*Gender, age*	*Etiology*	*Location*	*Symptom*	*Frankel grading scale initial→final*
1990	Mavroudakis *et al*.[9]	M, 38 years	Arteriovenous malformation	T1-2	Back pain Urinary retention	D→E
1990	Schwerdtfeger *et al*.[11]	M, 60 years	Anticoagulant therapy	C5-T3	Back pain Sensory disturbance	A→E (Day 2)*
1994	Katsuragawa *et al*.[6]	M, 15 years	Unknown	L3-4	Back pain	E→E
1998	Tamano *et al*.[12]	F, 32 years	Unknown	T2-4	Back pain Sensory disturbance	D→E
1998	Kulkarni *et al*.[8]	F, 61 years	Anticoagulant therapy	L1-3	Back pain Urinary retention	D→D

*The day when initial improvement was observed

patients. MRI can define the anatomy of the hematoma with a high degree of accuracy, and serial MRI can detect expansion or continued bleeding. Neurologic symptoms must be monitored closely using the Frankel grading scale. Severe symptoms at the onset, or clinical worsening and lack of improvement are observed, surgical intervention was applied. But with appropriate caution, nonsurgical management of SSH should become more common.

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