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Traumatic long-segment spinal subdural hematoma extending from C2 to L1 managed conservatively: a case report

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Case Report

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Abstract

Background

Spinal subdural hematoma (SSDH) is rare, and traumatic hematomas extending across most of the spinal canal are exceptional. Long-segment disease in a neurologically stable older patient creates a management dilemma because extensive decompression may itself cause substantial morbidity and spinal instability.

Case presentation:

A 76-year-old Asian man presented 1 hour after a fall from approximately 3 m with diffuse pain and restricted movement involving the head, neck, thoracic and lumbar spine, and abdomen. He was alert and cooperative, with no clearly documented limb weakness, grossly preserved superficial sensation, and no documented sphincter dysfunction. Computed tomography showed T4 and L1 compression fractures and a posterior intraspinal hyperdensity. Magnetic resonance imaging demonstrated an extensive posterior spinal subdural hematoma from C2 to L1. Because his neurological status remained stable and multilevel decompression was considered high risk, a multidisciplinary team selected conservative management with spinal precautions, strict bed rest, analgesia and supportive care, repeated neurological examinations, serial imaging surveillance, and rehabilitation. No progressive neurological deterioration occurred. Follow-up spinal magnetic resonance imaging on hospital day 18 showed substantial hematoma resolution, and the patient was discharged in good condition. At 180 days after discharge, he remained neurologically normal, was able to perform activities of daily living, and had no obvious residual abnormal signal on magnetic resonance imaging.

Conclusions

Extensive radiological involvement alone should not determine management. In selected patients without progressive neurological deficits and with prohibitive operative risk, closely monitored conservative management may be reasonable. Early magnetic resonance imaging and structured serial neurological assessment are essential, and urgent decompression remains indicated if neurological function or imaging worsens.

Background

Spinal subdural hematoma (SSDH) is an uncommon form of spinal hemorrhage and represents a small proportion of spinal hematomas. Reported causes include coagulopathy, antithrombotic therapy, lumbar puncture, spinal procedures, vascular malformations, neoplasms, and trauma [1]. Clinical manifestations vary with the level, volume, and rate of hematoma expansion and may include axial pain, radiculopathy, weakness, sensory disturbance, sphincter dysfunction, or acute spinal cord compression.

Long-segment SSDH is particularly rare. Published cases have involved diverse causes and have been treated surgically or conservatively, with outcomes determined more by neurological progression, hematoma behavior, and operative feasibility than by craniocaudal length alone [2–8]. We report a traumatic SSDH extending from C2 to L1 in an older man whose neurological examination remained stable and who was managed conservatively. The educational value of this case lies in the tension between striking imaging findings and a relatively preserved examination, and in the need for individualized, closely monitored decision-making.

Case presentation

Patient information

A 76-year-old Asian man was admitted approximately 1 hour after falling from a height of about 3 m. He reported diffuse pain and restricted movement involving the head, posterior neck, thoracic and lumbar regions, and abdomen.

The available source records did not contain a complete account of the patient's pre-existing medical conditions, long-term medication or antithrombotic exposure, family history, psychosocial history, or relevant genetic information. No relevant previous spinal intervention was documented.

Clinical findings

The patient was awake and cooperative. At presentation, his body temperature was 36.5°C, pulse rate was 73 beats/min, and blood pressure was 139/74 mmHg. Respiratory rate and oxygen saturation were not documented in the available source medical record.

There was tenderness over the posterior cervical region and marked tenderness over the thoracic and lumbar spine, with restricted movement but no obvious thoracic deformity. Cardiopulmonary and abdominal examinations revealed no significant abnormalities. No clear reduction in motor power was documented in the four limbs; superficial sensation was grossly preserved, and no definite bladder, bowel, or perineal dysfunction was recorded. The available findings were consistent with American Spinal Injury Association Impairment Scale grade E/Frankel grade E, although a contemporaneous standardized examination score was not documented.

Timeline

Time	Event	Key findings/management
0 h	Trauma	Fall from approximately 3 m; diffuse axial and abdominal pain with restricted movement.
Approximately 1 h	Hospital admission	Stable vital signs; posterior cervical, thoracic, and lumbar tenderness; no clearly documented focal neurological deficit or sphincter dysfunction.
Initial evaluation	Computed tomography	T4 and L1 compression fractures; posterior intraspinal hyperdensity at C2-C7; cervical disc protrusions and associated soft-tissue findings.
Early hospital course	Magnetic resonance imaging	Long-segment posterior SSDH extending from C2 to L1 with dural sac/spinal canal compression.
Approximately 6 h	Multidisciplinary treatment decision	Conservative management selected because neurological status was stable and extensive decompression was considered high risk.
Hospital days 1–6	Pain management	Severe axial pain treated with acetaminophen 1.0 g intravenously every 8 h; tramadol 100 mg intramuscularly was used as rescue treatment for breakthrough nocturnal pain.
Throughout hospitalization	Monitoring and rehabilitation	Spinal precautions, strict bed rest, bracing, repeated neurological examinations, serial imaging surveillance, and rehabilitation; no progressive neurological deterioration.
Hospital day 18	Follow-up MRI and discharge	Substantial hematoma resolution on MRI; neurological examination remained normal; discharged in good general and mental condition.
180 days after discharge	Follow-up outcome	Neurological examination remained normal; the patient could perform activities of daily living; MRI showed no obvious residual abnormal signal. Lumbar and thoracic braces were still used, and excessive physical exertion was discouraged.

Diagnostic assessment

Computed tomography identified compression fractures at T4 and L1, suspected prevertebral soft-tissue edema and hemorrhage, and an arc-shaped posterior intraspinal hyperdensity along C2-C7 that compressed the dural sac. Additional findings included posterior disc protrusions at C2/3, C3/4, C4/5, C5/6, and C6/7, mild irregularity of several vertebral superior endplates, and a suspected T9 vertebral hemangioma. The principal diagnostic challenge was defining the compartment and full craniocaudal extent of the intraspinal collection; computed tomography alone could not reliably distinguish subdural from epidural blood.

Sagittal magnetic resonance imaging of the cervical, thoracic, and thoracolumbar spine demonstrated a continuous posterior intraspinal collection extending from C2 to L1, with mass effect on the dural sac.

The distribution and morphology were interpreted as a spinal subdural hematoma (Fig. 1). The main imaging differential was a spinal epidural hematoma. Magnetic resonance imaging was favored because it better demonstrated the lesion boundaries, relation to the dura and neural structures, and the long-segment extent.

Laboratory data, including coagulation indices, were not available in the source records. The final clinical-radiological diagnosis was traumatic long-segment spinal subdural hematoma extending from C2 to L1, accompanied by T4 and L1 compression fractures; spinal epidural hematoma was the principal alternative diagnosis. At presentation, the prognosis was considered guarded because of the extensive lesion and the potential for acute spinal cord compression despite the preserved examination. It became cautiously favorable after continued neurological stability and interval hematoma regression were confirmed.

Therapeutic intervention

The hematoma extended from C2 to L1. In the absence of progressive weakness, a sensory level, or sphincter dysfunction, the multidisciplinary team judged that extensive multilevel decompression would expose the patient to substantial operative trauma, blood loss, postoperative instability, and anesthetic risk. An initial conservative strategy was therefore selected. Management comprised strict bed rest, spinal protection and bracing, analgesia and supportive care, close neurological observation, and serial computed tomography and/or magnetic resonance imaging. During the first 6 hospital days, acetaminophen 1.0 g was administered intravenously every 8 hours for severe pain; tramadol 100 mg was administered intramuscularly as rescue treatment when nocturnal breakthrough pain occurred. Rehabilitation included gradual mobilization, limb-strength training, balance and gait training, pain control, and prevention of complications related to prolonged bed rest.

The treatment plan included a predefined threshold for urgent surgical reassessment: new or progressive motor weakness, an ascending sensory level, bladder or bowel dysfunction, worsening pain with neurological change, radiological enlargement of the hematoma, or increasing spinal cord compression.

Because neurological examinations remained stable and follow-up imaging did not show hematoma enlargement or increasing spinal cord compression, conservative management was continued without conversion to surgery. The only treatment adjustment was the use of intramuscular tramadol as rescue analgesia when scheduled acetaminophen did not adequately control nocturnal pain.

Follow-up and outcomes

During hospitalization, the patient underwent daily neurological examinations, all of which revealed no abnormalities. During the first 6 days after admission, axial pain was the predominant symptom and improved under the analgesic regimen. Adherence to bed rest, spinal precautions, brace use, and

rehabilitation was assessed through direct inpatient observation and subsequent clinical follow-up. No clinically significant intolerance to acetaminophen or tramadol was documented in the available records.

On day 18 after admission, follow-up spinal MRI showed substantial resolution of the hematoma. The patient remained neurologically normal, was in good general and mental condition, and was discharged in accordance with medical advice. No treatment-related adverse event, unexpected neurological deterioration, or other unanticipated complication was recorded during hospitalization. At 180 days after discharge, the patient was able to perform activities of daily living and his neurological examination remained normal. Follow-up MRI showed no obvious residual abnormal signal. Although he continued to wear lumbar and thoracic braces, he was advised to avoid excessive physical exertion.

Particular attention was also paid to the patient's psychological condition after the traumatic event. Outpatient consultation with a psychologist was recommended to screen for and facilitate early intervention for possible post-traumatic stress symptoms.

Discussion

Traumatic SSDH is thought to result from rupture of vessels within or adjacent to the spinal subdural compartment after abrupt mechanical loading. Neurological impairment depends on the rate of bleeding, spinal canal reserve, lesion location, and secondary compression. The patient in this report had an unusually extensive C2-L1 collection but no clearly documented focal deficit or sphincter dysfunction, illustrating that radiological length and clinical severity may be discordant.

Magnetic resonance imaging is the preferred modality for characterizing suspected SSDH because it defines the compartment, craniocaudal extent, mass effect, and signal characteristics more accurately than computed tomography [9–12]. The inverted Mercedes-Benz sign has been described as a useful axial clue to subdural location, although it is not invariably present [10]. In this case, computed tomography raised suspicion for an intraspinal hematoma, whereas whole-spine magnetic resonance imaging established the C2-L1 extent and supported the subdural diagnosis.

Management is not standardized. Urgent decompression is generally favored when there is rapid or progressive neurological decline, substantial focal compression with a surgically accessible lesion, or failure of conservative management [13–16]. However, surgery for a very long lesion may require extensive exposure and may increase the risk of instability and postoperative complications [17–19]. Conversely, selected patients with stable or improving examinations have recovered under conservative management with intensive observation and serial imaging [20–22]. Table 1 summarizes several reported long-segment cases and demonstrates that both surgical and nonsurgical approaches have produced variable outcomes.

In the present case, the management decision was based not on lesion length alone but on the combination of preserved neurological function, the anticipated morbidity of multilevel decompression, the patient's age, and the ability to perform close inpatient monitoring. Conservative management

should not be interpreted as absence of treatment. It requires structured neurological examinations, ready access to repeat imaging, prevention of secondary complications, and a low threshold for surgery if deterioration occurs.

This report has several strengths: it documents an exceptionally long traumatic SSDH, provides cervical-to-thoracolumbar magnetic resonance images, and illustrates a clinically important mismatch between extensive imaging abnormalities and a stable neurological examination. Its limitations include the retrospective single-case design, absence of surgical or pathological confirmation of the subdural compartment, incomplete documentation of comorbidities, medication and anticoagulant exposure, coagulation testing, the duration of analgesic treatment, serial objective pain scores, standardized serial neurological scores, and detailed quantitative follow-up imaging measurements. These limitations preclude broad treatment recommendations. The case supports only the narrower conclusion that carefully selected, neurologically stable patients may be considered for monitored conservative management when the operative burden is prohibitive.

Conclusions

Traumatic long-segment SSDH can present with striking whole-spine imaging abnormalities despite a relatively preserved neurological examination. Whole-spine magnetic resonance imaging and repeated standardized neurological assessment are central to diagnosis and monitoring. For patients without progressive deficits and with high operative risk, conservative management may be considered within a setting that permits close observation and immediate surgical escalation. Radiological extent should inform, but should not independently dictate, the treatment decision.

Abbreviations

ASIA
American Spinal Injury Association
CT
computed tomography
MRI
magnetic resonance imaging
SSDH
spinal subdural hematoma.

Declarations

Ethics approval and consent to participate

The Ethics Committee of the Affiliated Hospital of Jining Medical University waived ethical review for this case report. Written informed consent for use of the patient’s anonymized clinical information was obtained from the patient or an authorized representative, as applicable.

Consent for publication

Written informed consent was obtained from the patient or his authorized representative for publication of this case report and the accompanying de-identified images. A copy of the written consent is available for review by the Editor-in-Chief on request.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

CC and ZW made substantial contributions to the conception and design of this case report. CC collected and organized the clinical data and drafted the initial manuscript. ZW reviewed and interpreted the radiological images and critically revised the manuscript for important intellectual content. SS provided technical and material support and assisted with data collection and manuscript revision. All authors read and approved the final manuscript and agreed to be accountable for all aspects of the work.

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During preparation of this manuscript, the authors used OpenAI ChatGPT solely for English-language editing, organization, and formatting. The authors reviewed and revised the output, verified all clinical content against the source records, and take full responsibility for the final manuscript.

Availability of data and materials

All data generated or analyzed during this study are included in this article. Additional de-identified information may be available from the corresponding author on reasonable request, subject to patient privacy and institutional requirements.

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Table

Table 1
Reported long-segment spinal subdural hematomas and outcomes

Report	Age/sex	Etiology	Extent	Management	Outcome
Abou-Madawi et al. [2]	11/M	Aplastic anemia	C2-S1	Conservative	Good neurological outcome
Qi et al. [4]	59/M	Lumbar drainage	T7-S1	Laminectomy and evacuation	Poor outcome
Grobovschek and Schurich [5]	41/M	Trauma	C3-L2	Conservative	Poor outcome
Grunberg et al. [6]	70/M	Trauma	T3-L3	Surgery	Good outcome
Boukobza et al. [7]	74/M	Trauma	T6-L4	Conservative	Good outcome
Braun et al. [8]	72/M	Spontaneous	Clivus-L4	Conservative	Good outcome
Present case	76/M	Trauma	C2-L1	Conservative	Good neurological outcome

M, male. Outcomes are reproduced as described in the source manuscript and should not be interpreted as directly comparable because definitions and follow-up periods differed among reports.

Figures

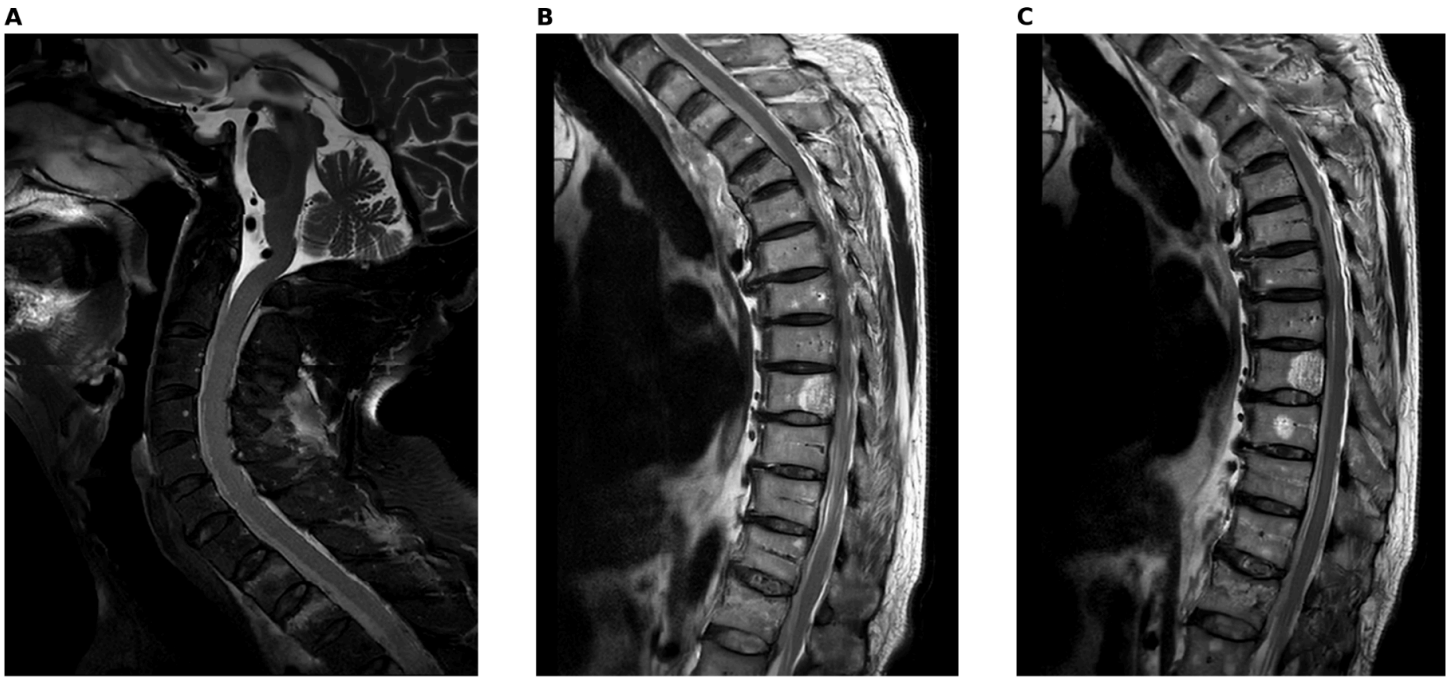


Figure 1

Sagittal MRI showing C2-L1 spinal subdural hematoma. (A) Cervical sagittal magnetic resonance image showing the proximal posterior intraspinal collection. (B) Thoracic sagittal image demonstrating continuation of the collection through the thoracic canal. (C) Thoracolumbar sagittal image showing distal extension to approximately L1. The images have been de-identified.

Supplementary Files

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- CAREchecklist.png