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Case Report

Delayed spinal epidural hematoma after posterior cervical spine surgery: a case report

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Abstract: Spinal epidural hematoma (SEH) is known as a rare but devastating complication of spinal surgery, which may typically lead to severe consequences if not timely intervened. The incidence of delayed spinal epidural hematoma (DSEH) is considerably lower. Various risk factors might be involved in this process, including hypertension, age, high body mass index, use of non-steroidal anti-inflammatories pre-operation, coagulation dysfunction, Rh-positive blood type and five operative levels. In this study, a 72-year-old woman visited our hospital with the symptoms of numbness and pain in both of her hands. Imaging examinations confirmed the clinical diagnosis of cervical canal stenosis at multiple levels. We conducted total laminectomy cervical vertebra for decompression at C3-C6 and a portion of C7 for her. On postoperative day three, the patient complained of sudden neck pain and numbness of the extremities and even developed a substantial neurological deficit with absent motor (grade 1/5) and sensory nerve function in the entire body. Emergency magnetic resonance imaging (MRI) demonstrated an SEH extended from C3 to C6 followed by significant compression of the spinal cord. Then prompt evacuation of hematoma was conducted three hours after the onset of symptoms. Postoperatively, the patient's motor (grade 4/5) and sensory nerve function improved dramatically. After a month of follow-up, she pointed out that there was a slight numbness in her left fingertip and she could walk slowly without other's help. Once the symptoms occurred, it was of great importance to carry out a comprehensive and detailed medical record, physical examinations, imaging examinations, timely and effective bleeding control during the surgery and high-quality postoperative monitoring.

Keywords: Delayed spinal epidural hematoma, risk factors, hypertension, posterior cervical spine surgery

Introduction

Spinal epidural hematoma (SEH) is an infrequent but devastating complication of spinal surgery and may lead to severe consequences without proper and timely intervention [1-3]. In 1869, Jackson first reported SEH [9]. It's estimated that the incidence of postoperative SEH that requires evacuation is 0.1% to 0.4% [4-8]. Risk factors of hypertension, age, high body mass index, pre-operative use of non-steroidal anti-inflammatories, coagulation dysfunction, Rh-positive blood type and five operative levels might accelerate the occurrence of SEH [3, 4, 6, 10]. Severe back pain, progressive paraplegia and persistent neurological deficits all indicates that SHE may develop [7, 11]. With the rapid development of radiographic techniques, magnetic resonance imaging (MRI) is considered as the best choice for early diagnosis of SEH [12]. "Delayed SEH" is defined as occurring more than 3 days after operation, the incidence of which is 0.17% [13]. Only a few cases after posterior cervical spine surgery have been reported as DSEH [14, 15]. In the present study, we reported an uncommon DSEH case who received total laminectomy of cervical vertebra for decompression at C3-C6 and portion of C7.

Case presentation

A 72-year-old woman (height: 153 cm, weight: 46 kg) with a history of hyperthyroidism for approximately 20 years visited our hospital with the symptoms of numbness and pain in her both hands and no other medical history. She complained of predominant dysesthesia at the left fingertip, sensations of the chest band and weakness of the lower-extremity. Physical examination revealed that strength in the left

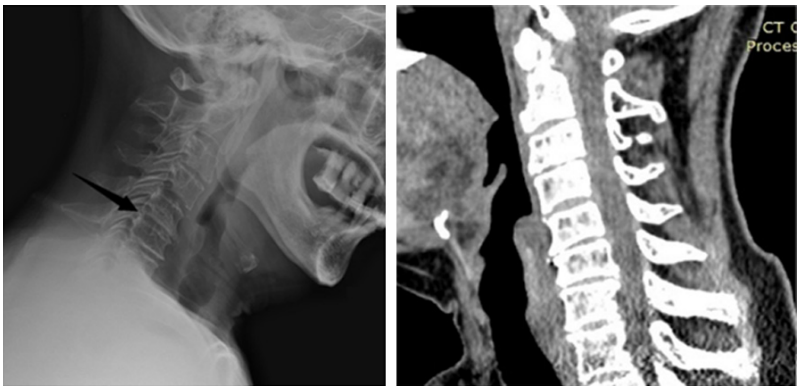

Figure 1. Left: Plain radiographs demonstrating the disappearance of cervical physiological curvature. Right: Ossification of the posterior longitudinal ligament was not observed by CT scanning (black arrowheads).

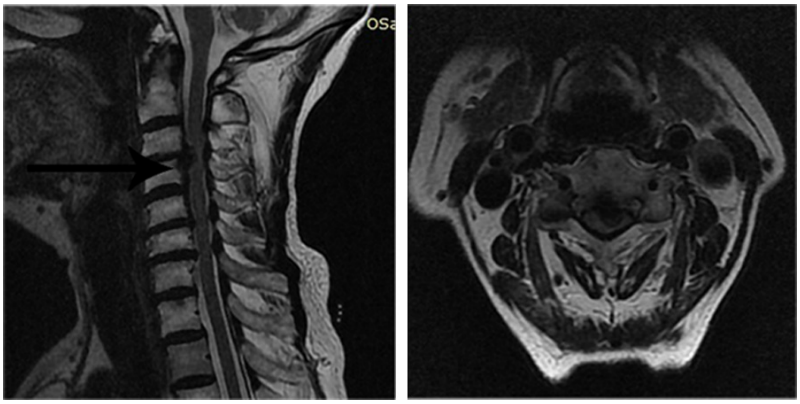

Figure 2. Left: Pre-operative cervical T2 -weighted MRI revealed C5-7 canal stenosis and high-intensity compression at C3-C4. Right: An axial image at C3-C4 (black arrowheads).

hand was grade IV (right hand was grade V) and there was a moderate weakness in ankle dorsiflexion and toe extensors (grade IV). Results of the neurologic examination demonstrated positive Hoffman sign (on her both arms), and Babinski sign. Relevant laboratory examinations were performed, according to hyperthyroidism, and no abnormality was found. The results of the bleeding time, platelet count, prothrombin time (PT), activated partial thromboplastin time (APTT), hepatic function, renal function, international normalized ratio (INR), and plasma d-dimer levels were all within normal references. Plain radiographs of the cervical spine revealed the cervical physiological curvature disappeared and the disc space at C5-6 and C6-7 levels narrowed (**Figure 1**, Left). There was no ossification of the posterior longitudinal ligament observed by computed tomography (CT) scanning (**Figure 1**, Right). Cervical T2-weighted MRI revealed canal stenosis at C5-6 and C6-7 and high-intensity compression at C3-C4 level (**Figure 2**, Left), while axial MRI revealed intervertebral disc herniation at C3C4 level (**Figure 2**, Right). The clinical diagnosis of cervical canal stenosis at multiple levels was confirmed by MRI.

Due to the stability of the spine was normal and all the risks factors were considered, the patient finally received total laminectomy cervical vertebra for decompression at C3-C6 levels and a portion of C7 level under general anesthesia. During the surgery, severe stenosis at the C3-4 and C6-7 levels was observed, and the decompression was confirmed successful confirmed. By using the methods of Gelfoam packing and bone wax, we controlled the epidural and section bleeding and did not observe cerebrospinal fluid leakage. The wound of the operation was sutured step-by-step, and a drain was inserted as normal. The operation was successful and lasted for 125 minutes, with 100 ml blood loss. The patient was completely awake after the operation and able to move extremities easily after the removal of the breathing machine. Then, the patient was carefully observed in the post-anesthesia care unit for 30 minutes before the vital signs were stable.

After the operation, the patient had good rest in bed and was administered with pantoprazole sodium used for stress ulcer prophylaxis, neurotrophic medicine (Neurotropin), hormonotherapy with methylprednisolone and also a stool softener and a narcotic for pain control. The vital signs of the patient were stable and the feeling in both hands was good. Given to the

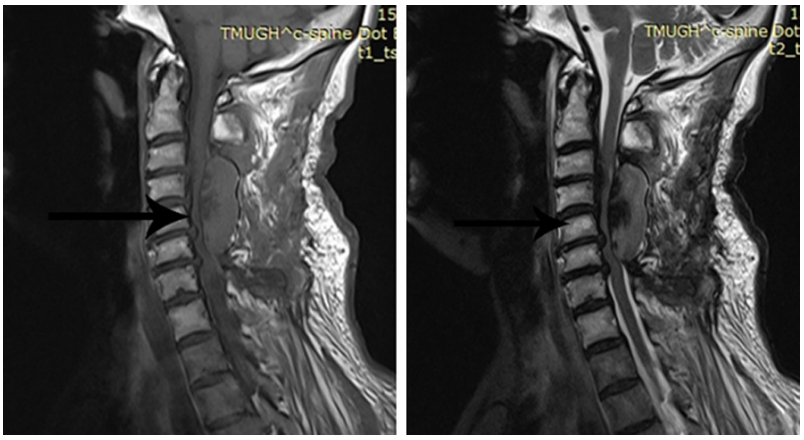

Figure 3. On the 3rd postoperative day, MRI demonstrated a large epidural hematoma extending from C3 to C6 (black arrowheads).

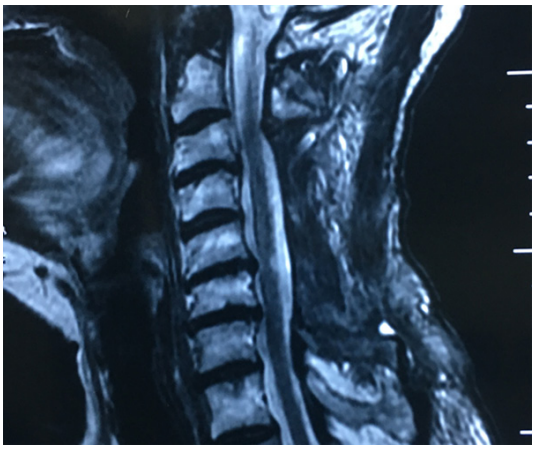

Figure 4. Compression of the spinal cord at C3-C4 and a myelomalacia focal at C5-C6 were revealed using sagittal MRI of the cervical spine at the one-month follow-up.

reason that the simple posterior operative decompression was conducted without internal fixation, the patient was asked to stay in bed for 2 weeks and avoid strenuous neck activity. On postoperative day one, the drain was removed, approximately 210 ml of fluid was drained, and physical therapy was gradually initiated. An increased rate of D-dimers at 8438 ng/mL (normal range, 0 to 500 ng/mL), indicating the activation of the coagulation process. There were no remarkable abnormalities in the evaluation of the laboratory examinations, however no anticoagulant drugs were administered due to fear of bleeding.

Approximately 3 days after the operation, the patient complained of sudden pain of the neck and numbness of the extremities. Decreased sensation with subjective numbness and pain was observe from her neck to foot, extremely in the abdominal region, hips, pelvis and extremities. Forty minutes after the first complaint, a substantial neurological deficit with absent motor (grade 1/5) and sensory nerve function developed in the entire body. Emergency MRI demonstrated that a SEH extended from C3 to C6 with significant compression of the spinal cord appeared (**Figure 3**), during which the patient suffered from complete paraplegia with no reflexes of the Babinski sign. Then an emergency operation was conducted three hours after the onset of the symptoms under local anesthesia. During the operation, a skin incision was widely extended, the muscle was carefully dissected, and then a large hematoma was discovered, and had occupied spinal cord. No active bleeding was noted in muscular layer, while there were some bleeding exudation at the epidural space, and on the edge of the broken end of the lamina. Gelfoam packing, bone wax and bipolar coagulation were meticulously applied to control bleeding. After which no additional bleeding or minimal epidural bleeding was observed. The course of the revision surgery was successful and the patient's motor (grade 4/5) and sensory nerve function improved dramatically. Subsequently, the patient was transferred to the care unit with conventional treatment and the vital signs were as follows: blood pressure was approximately 140/80 mmHg, the heart rate was around 70 beats/min. Three hours after the revision operation, the extremities (grade 1/5) were in weakness and a hematoma was suspected at the same site, then, the patient was immediately transferred to the operating room for posterior surgical evacuation of the hematoma without any relevant radiologic examinations. The hematoma was observed at the same level and was evacuated with caution. For the reason that it was hypercoagulable and might be difficult to drain the fluids, thus, a drain with larger pores was placed, followed by the reinsertion of

other instrumentations and the grafts. The neurologic symptoms improved greatly after hematoma evacuation, and medications that applied included pantoprazole sodium, Neurotropin, methylprednisolone, mannitol, stool softener, dezocine and diazepam.

On the first postoperative day, the vital signs of the patient were normal and the blood pressure was 141/78 mmHg. We sought to determine whether the patient could return to the baseline observed prior to hospitalization when the blood pressure was 90/60 mmHg. Then, an anti-hypertensive drug was applied for treatment. The patient's bilateral upper-extremity muscle strength was in grade 4/5, bilateral lower extremities were in grade 3/5, and also numbness was observed in the distal limbs. On the second postoperative day, the patient's general condition was stable. The drain was removed, and approximately 160 ml of fluid was drained. On the 7th postoperative day, the condition of weakness improved gradually, and a Foley catheter was removed without urinary retention. In addition the patient was encouraged to perform functional rehabilitation exercises in bed. On the 14th postoperative day, the patient could ambulate with the help of her family, and the muscle strength of extremities was in grade 4/5. Slight dysesthesia was noted at her limbs, but the patient was quite satisfied with the management and treatment. Results of the laboratory reexaminations showed that only the protein content was a little low. No clopidogrel and aspirin were applie during this period. On the 28th postoperative day, the incision healed, and she was able to walk around the ward with others' help. Physical examination revealed that the motor weakness recovered to grade 4+ in both the upper and lower extremities, and there were no significant axial or neurological symptoms except the numbness in the bilateral fourth and fifth fingers and all toes. Further rehabilitation was conducted after discharge from the hospital. After one month follow-up, the patient complained of slight fingertip numbness and she also told that she could walk slowly without others' help. No other obvious compressions of the spinal cord or local epidural hematomas were observed in MRI (**Figure 4**). At the six months follow-up, slight numbness still existed in her left fingertip, but she could walk freely as usual. Further follow-up will be continued.

Discussion and conclusion

SEH is a devastating complication of spinal surgery which is characterized by acute onset and rapid progression and may be a high risk for nerve dysfunction, poor prognosis and even patients' lives, however, the incidence of DSEH is considerably lower [16, 17]. Multiple risk factors involved in the process of SEH, including hypertension, age, high BMI, pre-operative use of non-steroidal anti-inflammatory drugs, coagulation dysfunction, Rh-positive blood type and five operative levels [3, 4, 6, 10]. In this study, total laminectomy of cervical vertebra for decompression at C3-C6 and a portion of C7 levels was conducted under general anesthesia, and thus it was a multi-level spinal surgery. Only a high rate of D-dimers at 8438 ng/mL (normal range, 0 to 500 ng/mL) was detected after the operation, demonstrating the activation of the coagulation process, while other coagulation and hemostasis parameters remained within the normal range. No anticoagulant drugs were used to avoid possible bleeding. It is assumed that the major operation process, potential coagulation dysfunction and her age potentially contributed to the occurrence of SEH. It is a controversial clinical issue of whether the anticoagulant therapy could achieve a balance between effectiveness and safety [18-20]. Normal blood pressure was reported when the patient was admitted, however, the blood pressure was approximately 140/80 mmHg after surgery, the condition of which seemed to represent 'hypertension' for the patient who typically exhibited the blood pressure of 90/60 mmHg. The condition of the previously reported low pressure was ignored until the occurrence of SEH. The reason might be that different patients possessed different characteristics and exceptions that could result in serious medical consequences were often neglected in clinical practice. However, no similar cases have been reported. In addition, based on the postoperative observation, the patient did not strictly comply with doctor's orders to avoid strenuous activity, which also increased the possibility of bleeding. To conclude, all of these conditions induced SEH of the patient.

A systematic review of literature, revealed only few reports about DSEH after posterior cervical spine surgery. Neo M. et al. reported a case of DSEH on the 9th postoperative days, which

was caused by arterial bleeding from the muscle wall [15]. A case of DSEH after posterior cervical laminoplasty was reported by Zhou F. et al. [14] The identification of SEH with C5 nerve root palsy was also reported, emphasizing the significance of early diagnosis and treatment. In general, it is of great importance to make a comprehensive and meticulous medical record, physical and imaging examinations, timely and effective bleeding control during the surgery and high-quality postoperative monitoring. DSEH can occur even up to two weeks after operation [13, 21, 22], thus, clinical physicians should pay more attention to the postoperative situation and follow-up with discharged patients.

DSEH is a rare but devastating complication in spine surgeries, especially in posterior cervical spine surgery. Various risk factors are associated with this condition. Acute local pain of the neck and back with progressive neurological deficits should be considered as possible causes of DSEH. Therefore, detailed medical records, relevant physical examination and imageological examinations, timely and effective therapy and postoperative surveillance is necessary.

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Disclosure of conflict of interest

None.

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