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Spinal Subarachnoid Hematoma after Spinal Anesthesia - A Case Report -

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Study Design: Case report.
Objectives: We report a case of spinal subarachnoid hematoma that developed after spinal anesthesia in a female patient who had no risk factors.
Summary of Literature Review: Few case reports of spinal subarachnoid hematoma (SSH) after spinal anesthesia have been published. The incidence of SSH is much less than that of epidural hematoma.
Materials and Methods: A 56-year-old female patient underwent arthroscopic surgery on her right knee under spinal anesthesia. Automated patient-controlled analgesia (PCA) was applied after surgery. On day 2, the patient complained of lower back pain, headache, nausea, and vomiting, but there were no neurological signs in the lower extremity. At day 5, she had a moderate fever (38.4°) and continuous nausea and vomiting. Magnetic resonance imaging (MRI) was conducted on day 5 and a large subarachnoid hematoma was found. We immediately performed surgical hematoma evacuation. Her low back and buttock pain improved immediately, and all symptoms disappeared in a week without any neurological sequelae.
Results: The unusual and vague symptoms in this case made the diagnosis difficult, but spinal MRI confirmed SSH. Immediate surgical hematoma evacuation improved all symptoms and left no neurologic sequelae.
Conclusions: SSH after spinal anesthesia may have cerebral symptoms that mimic the side effects of PCA. Early diagnosis by MRI and surgical evacuation of the SSH are a reasonable approach for this complication.

Key Words: Spinal subarachnoid hematoma, Spinal anesthesia

Few case reports of spinal subarachnoid hematoma (SSH) after spinal anesthesia have been published. The incidence of SSH is much lower than that of epidural hematoma.[1] Most cases of SSH clinically manifest with lower-extremity neurological deficits. Their prognosis has been reported to be variable, and no general agreement exists regarding the management of SSH. Several risk factors have been postulated. We experienced a case of SSH that developed after spinal anesthesia in a female patient who had no risk factors. Unlike previous cases, signs of meningeal irritation were her first clinical manifestation. Her diagnosis was delayed because the symptoms were vague, but the SSH was successfully managed by surgical hematoma evacuation.

Case Report

A 56-year-old female patient underwent arthroscopic surgery on her right knee under spinal anesthesia at our hospital. On the preoperative physical exam, there were no specific findings, and preoperative laboratory findings related to blood coagulation were all within the normal limits (Table 1).

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Table 1. Laboratory findings related to blood coagulation

Tests	Results	Normal value
Platelet count	326,000/mm^3	130,000~400,000/mm^3
Prothrombin time	10.1 sec	9.2~12.5 sec
Activated partial thromboplastime time	25.9 sec	22.0~38.0 sec
Platelet function analysis epinephrine	192	81~192

She had no previous medical history and did not take any anti-platelet drugs or anticoagulants. The dural puncture was performed with a 23-gauge Quincke needle through the L3-4 interlaminar space with the patient in the lateral decubitus position. It was done quickly, without any difficulty. The presence of clear cerebrospinal fluid (CSF) was checked and 13 mg of 0.5% bupivacaine was injected.

Arthroscopic partial meniscectomy was performed uneventfully, and the procedure lasted 35 minutes. Automated patient-controlled analgesia (PCA) (Ace Medical, Koyang, South Korea) was applied. It included nefopam hydrochloride (100 mg), ketorolac tromethamine (180 mg), ramosetron hydrochloride (0.3 mg), and saline (80 mL). On day 2, the patient complained of lower back pain, headache, nausea, and vomiting, but there were no neurological signs in the lower extremity. On day 5, she had a moderate fever (38.4°) and continuous nausea and vomiting. The severity had increased. She experienced difficulties with position change. She had gait disturbance (Nurick grade III) and neck stiffness, and the Kernig sign was positive. However, she did not have any motor or sensory deficits. Magnetic resonance imaging (MRI) was performed on day 5 and a large subarachnoid hematoma was found. It was about 16.1 cm in length, was spread widely along nearly the entire cauda equina from L2 to L5, and had a heterogenous signal (hypointense in T2-weighted images and hyperintense in T1-weighted images) (Fig. 1). It was suspected to be an SSH. We immediately performed surgical hematoma evacuation. Wide laminectomy was performed from L3 to L4. The dorsal surface of the dura mater looked reddish, but was not especially tense. Aspiration was performed, and bloody CSF was drained (Fig. 2). A midline durotomy was performed, and clotted hematoma masses were found among the nerve fibers of the cauda equina. They were adherent to the nerve fibers, so removal of the hematoma by suction was impossible. All the masses were removed one by one. Her low back and buttock pain improved immediately, and all symptoms disappeared in a week without any neurological sequelae. Postoperative MRI was performed on day 12, and the hematoma had been completely removed (Fig. 3).

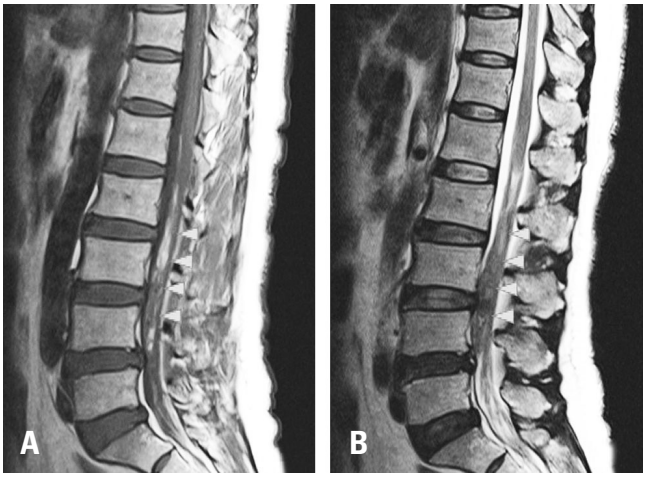

Fig 1. Spinal subarachnoid hematoma. Magnetic resonance imaging showed subarachnoid hematoma extending from L2 to L5. Cauda equina compression with subarachnoid hematoma was most severe at the L3-4 level. **(A)** Hyperintense in a T1-weighted image, **(B)** Hypointense in a T2-weighted image.

Fig 2. The dorsal surface of the dura mater looked reddish, but was not especially tense. Aspiration was performed, and bloody cerebrospinal fluid was drained.

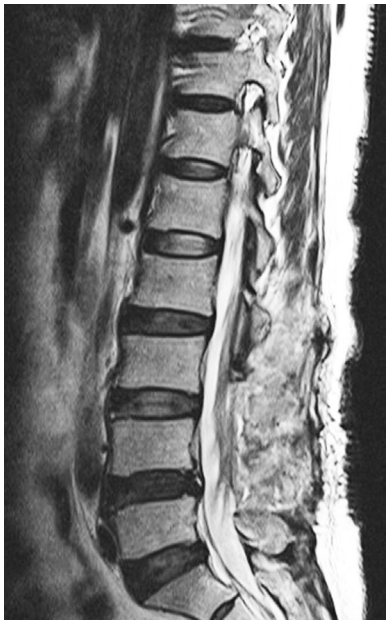

Fig 3. Postoperative magnetic resonance imaging was obtained on the 12th day after hematoma evacuation surgery, and the hematoma had been completely removed.

Discussion

Spinal hematoma is a rare complication after spinal anesthesia. Spinal epidural hematoma is more common, accounting for 75% of such hematomas, while SSH is much less common, only occurring in 15.7% of cases of spinal hematoma.[2] SSH is different from spinal subarachnoid hemorrhage. The former refers to blood collection forming a clot in the subarachnoid space that can compress the spinal cord and cauda equina. Episodes of subarachnoid hemorrhage are more common; however, the flow of CSF dilutes and washes away the blood, reducing the likelihood of clot formation.[3,4]

Because SSH is so rare, there is no general agreement regarding its exact pathogenesis, clinical manifestation, and treatment. In terms of causative factors, it seems to be closely related with coagulopathy, anticoagulant or antiplatelet therapy, vascular malformation, neoplasms, and other factors. Additionally, spinal stenosis or other degenerative changes in the spine play a role as predisposing factors for iatrogenic SSH by affecting CSF circulation, making it difficult for the CSF to wash out the active bleeding in cases of spinal subarachnoid hemorrhage.[2,3] Our patient had no other risk factors. She was relatively young, had no significant previous medical history, and her lumbar spine had no pathology.

The underlying mechanism and origin of bleeding in formation of spinal subarachnoid hematoma after lumbar puncture are not completely understood. Usually, iatrogenic puncture of radicular vessels in the subarachnoid space acts as the source of bleeding, and the infiltration of blood to the subarachnoid space occurs through lacerations in the arachnoid caused by the intradural puncture. The blood collection can form a clot that may compress and damage the spinal cord and nerve roots of the cauda equina. It may lead to spinal ischemia and cause serious clinical symptoms.[3] In the intraoperative findings of our patient, the anterior side of the dura mater was stained with blood. Thus, we suspect that while performing spinal anesthesia, the needle penetrated the anterior side of the dura mater and damaged the posterior side of the vertebral body. The hemorrhage might have stemmed from bleeding of the vertebral body; however, no previous report has proposed a similar pathogenesis.

The clinical manifestation is usually delayed until 2–4 days after the trigger event.[5] The usual pattern involves sudden back pain that radiates to the buttock and lower extremities. The grade of neurological deficits has a wide spectrum, ranging from simple radicular pain to cauda equina syndrome.[2,3,6,7] One-third of patients with SSH have cerebral symptoms or signs of meningeal irritation, such as headache, vomiting, nuchal rigidity, and opisthotonos, in addition to acute back pain.[2] Our patient showed back pain, headache, nausea, and vomiting starting on the second day after surgery. We thought that those symptoms were routine side effects of the analgesics that were included in PCA; however, the patient began to show signs of meningeal irritation starting on the fifth day after surgery.

Spinal MRI is the diagnostic test of choice, and epidural hematoma is the main differential diagnosis of SSH. Epidural hematoma has been described as a homogeneous lesion that is most frequently located posterior to the dural sac at the lumbar spinal level. In contrast, SSH shows heterogeneous signal intensities, because the hematoma is older than epidural hematomas due to the delayed onset of symptoms after the trigger event.[8]

No study has analyzed the functional outcomes of SSH depending on the treatment modality. In a meta-analysis

of all spinal hematomas, early surgical treatment and less severe initial neurological deficits were important predictors of better neurological recovery.[2] A few authors reported that conservative treatment yielded good results, but their cases had only mild radicular symptoms.[5,9] Our patient showed no distal motor deficits. However, her cerebral symptoms gradually got worse and she could not walk after the operation. Many previous reports have warned that if the diagnosis is overlooked or surgical removal is delayed, significant neurological impairment is unavoidable.[2,3,10] Thus we decided to perform surgical treatment promptly. Fortunately, her cerebral symptoms disappeared immediately, and she could walk without any difficulty.

SSH after spinal anesthesia may have cerebral symptoms that mimic the side effects of PCA. Early diagnosis by MRI and surgical evacuation of the SSH are a reasonable approach for this complication.

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Case Report

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척추 마취 후 발생한 척추 지주막하 혈종 - 증례 보고 -

이정수 • 안동기 • 신원식 • 유인선 • 이호영

서울성심병원 정형외과

연구 목적: 증례 보고

목적: 저자들은 위험 인자가 없는 한 여성 환자에게서 척추 마취 후 발생한 척추 지주막하 혈종 사례를 보고하고자 하였다.

선행 연구문헌의 요약: 척추 마취 후 발생한 척추 지주막하 혈종에 대한 사례 보고는 거의 없었다. 척추 지주막하 혈종의 유병률은 경막외 혈종보다 훨씬 낮다.

대상 및 방법: 56세 여자 환자는 척추 마취하 우측 슬관절 관절경 수술을 받았다. 수술 후 통증 자가 조절 장치(PCA)가 사용되었다. 수술 후 2일째 환자는 요통, 두통, 메스꺼움, 구토를 호소하였으나 하지의 신경학적 증상은 없었다. 수술 후 5일째 중등도의 발열(38.4°C)이 발생하였고 메스꺼움 및 구토가 지속되었다. 수술 후 5일째 척추 자기공명영상검사를 시행하였고 거대 지주막하 혈종이 발견되었다. 저자들은 즉시 외과적 혈종 제거술을 시행하였다. 수술 직후 요통과 둔부 통증이 바로 호전되었으며, 1주일 안에 신경학적 후유증 없이 모든 증상이 좋아졌다.

결과: 본 증례는 초기에 비전형적이고 애매한 증상들로 적절한 진단이 어려웠다. 그러나 척추 자기공명영상 검사를 하여 척추 지주막하 혈종 진단을 확실히 할 수 있었다. 그리고 즉시 외과적 혈종 제거술을 하여 신경학적 후유증 없이 모든 증상이 호전되었다.

결론: 척추 마취 후 발생한 척추 지주막하 혈종은 통증 자가 조절 장치(PCA)의 약물 부작용과 유사한 대뇌 증상을 보일 수 있다. 자기공명영상 검사로 조기 진단을 하고 척추 지주막하 혈종을 수술적으로 제거하는 것이 여러 합병증에 대한 합리적인 접근법이라 하겠다.

색인 단어: 척추 지주막 혈종, 척추 마취

약칭 제목: 척추 지주막 혈종

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