Case Report

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Chemical meningitis after cervical transforaminal epidural steroid injection: a case report

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Abstract

We herein report a case of chemical meningitis that developed after cervical transforaminal steroid injection. A 49-year-old man presented with symptoms of meningitis (severe headache and neck stiffness) after cervical transforaminal steroid injection at the right C5–6 level. The injection solution was a mixture of lidocaine (0.3 mL), hyaluronidase (1 mL), placenta hydrolysate (2 mL), and normal saline (1 mL). The patient developed symptoms of meningitis 2.5 hours after the cervical epidural injection. Cerebrospinal fluid (CSF) analysis was performed 1 day after the injection, and the results showed an elevated white blood cell count at 7106 cells/μL. The patient's CSF analysis findings and symptoms did not differ from those of bacterial meningitis. However, considering that his symptoms developed 2.5 hours after the epidural injection, we believe that the patient developed chemical meningitis; therefore, he was symptomatically treated with an analgesic. Three days after the cervical transforaminal epidural injection, the patient experienced complete relief from the headache and neck stiffness. A Gram stain of the CSF revealed no organisms. Hence, the diagnosis of chemical meningitis was confirmed. Clinicians should be knowledgeable about the risk of this complication.

Keywords

Chemical meningitis, epidural injection, headache, complication, cerebrospinal fluid analysis, Gram stain

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Introduction

In pain clinics, epidural injection is widely used to manage axial neck and back pain

and radicular pain.[1,2] Previous studies have shown that epidural injection is effective for treatment of radicular pain or axial pain induced by spinal stenosis or herniated discs.[1,2] However, adverse effects such as neural injury, infection, cord or cerebral infarction, hematoma, and lidocaine-induced seizure can occasionally occur.[3–5] Moreover, chemical meningitis is a potential adverse effect of epidural injection.[6–8] This condition can cause several symptoms, such as headache, neck stiffness, fever, nausea/vomiting, and an altered mental status.[6–8] In all reported cases, chemical meningitis occurred after interlaminar lumbar epidural injection.

We herein describe a patient who developed chemical meningitis after cervical transforaminal epidural steroid injection (TFESI).

Case report

A 49-year-old man underwent TFESI in the right C6 nerve root under C-arm fluoroscopic guidance for control of radicular pain induced by right C5–6 foraminal stenosis due to spondylosis in a local pain clinic. The injected solution was a mixture of lidocaine (0.3 mL), hyaluronidase (1 mL), placenta hydrolysate (2 mL), and normal saline (1 mL). Prior to the TFESI, 0.3 mL of contrast medium had been injected to determine whether the needle tip was placed at the proper location. The patient had a history of avascular necrosis of both femoral heads. In addition, he had undergone left total hip replacement for avascular necrosis of the left femoral head 3 years previously. He had undergone a single TFESI procedure of the right C6 nerve root with the same injection material 3 months previously. However, he developed no adverse effects after the previous TFESI.

About 2 hours 30 minutes after the cervical TFESI, the patient developed a severe headache. He visited the emergency department of a university hospital around 2:00 AM the day after the epidural injection. Upon arrival, the patient's body temperature was 37.7°C, and his blood pressure, pulse rate, and respiratory rate were normal. Laboratory tests showed that his white blood cell (WBC) count was elevated to 18,390 cells/μL (reference range, 4,000–10,000 cells/μL) with a neutrophil count of 80.8%, and his C-reactive protein level was elevated to 0.897 mg/dL (reference range, 0.0–0.5 mg/dL). The patient was admitted at the physical medicine and rehabilitation department. Using a numeric rating scale (0 indicating no pain and 10 indicating the worst pain imaginable), the patient gave a rating of 9 for his headache, which was aggravated in the supine position and relieved in the sitting and standing positions. The patient had also developed neck stiffness. His mental status was normal, and no motor or sensory deficits were observed. The deep tendon reflexes in the bilateral upper and lower limbs were normal. Brudzinski's and Kernig's signs were negative. Brain computed tomography (CT) and magnetic resonance imaging revealed no abnormalities (Figure 1). In addition, cervical spine magnetic resonance imaging revealed no specific abnormal findings other than right C5–6 foraminal stenosis. Considering the patient's history, symptoms, and physical examination and imaging findings, we believe that he developed meningitis. Cerebrospinal fluid (CSF) analysis was performed around 1:00 PM (about 11 hours after arriving at the emergency room), revealing an elevated WBC count at 7106 cells/μL (polymorphonuclear cells, 93%; lymphocytes, 6%). Moreover, the patient's protein and glucose concentrations were 293.95 mg/dL (reference range, 15–45 mg/dL) and 52 mg/dL (reference range, 40–70 mg/dL), respectively. The CSF was cloudy. The patient's CSF analysis findings and symptoms did not differ

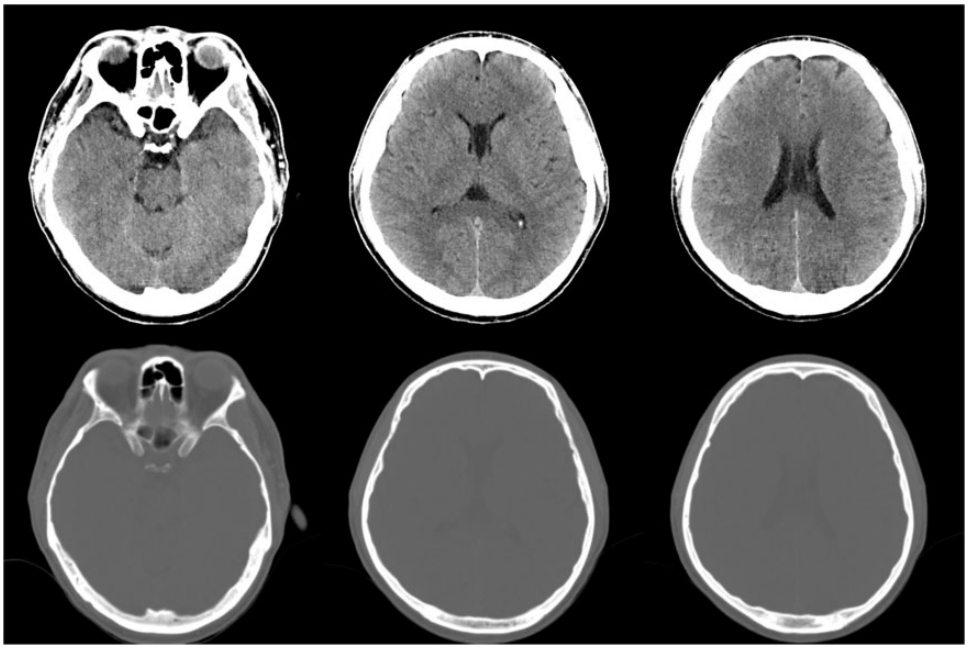

Figure 1. Non-contrast brain computed tomography revealed no abnormalities.

from those of bacterial meningitis. However, considering that the symptoms developed 2.5 hours after the epidural injection, we believe that the patient most likely developed chemical meningitis. Dexamethasone was not administered for the treatment of chemical meningitis because the patient had a history of avascular necrosis of the femoral head; instead, only intravenous propacetamol (1 mg) was administered every 4 to 6 hours for 2 days for symptomatic treatment. If the symptoms became aggravated, we planned to start intravenous antibiotic treatment. However, the symptoms were gradually relieved. Three days after the cervical TFESI, the patient experienced complete relief from the headache and neck stiffness. A Gram stain of the CSF revealed no organisms. Additionally, fungal infection was ruled out by the CSF culture result. A follow-up CSF evaluation was conducted 6 days after the epidural injection. The following results were obtained: WBC count, 193 cells/μL (polymorphonuclear cells, 3%; lymphocytes, 73%); protein concentration, 65.38 mg/dL; and glucose concentration, 53 mg/dL. Based on the course of the patient's symptoms and the CSF analysis findings, the diagnosis of chemical meningitis due to cervical TFESI was confirmed. The patient was discharged on the seventh day after the epidural injection.

Discussion

We have herein described a patient who developed chemical meningitis after TFESI. Although dexamethasone and antibiotics were not administered for treatment of the meningitis, the patient experienced complete relief from the symptoms of meningitis 3 days after the epidural injection.

The mechanism underlying the occurrence of chemical meningitis has not been clearly elucidated. However, it might be

caused by allergic or hypersensitivity reactions.[9] Although several reports have described chemical meningitis caused by local anesthetics after spinal anesthesia or intrathecal anesthetics and/or steroid injection,[10–13] only three cases of chemical meningitis after epidural injection for pain management have been reported.[6–8] In 1987, Gutknecht[6] reported a case of chemical meningitis after interlaminar epidural injection at the L12–1, L4–5, and L5–S1 levels with methylprednisolone for treatment of lower back pain and lumbar radicular pain. The patient's symptoms developed 4 hours after the epidural injection, and brain CT revealed air droplets in the subarachnoid space. In 2016, Shah et al.[8] reported a case of chemical meningitis with pneumocephalus. The symptoms developed 1.5 hours after the epidural injection of lidocaine, methylprednisolone, and betamethasone. The patient's symptoms completely resolved 48 hours after the onset of meningitis symptoms. In 2020, Koo and Cho[7] reported a case of chemical meningitis with pneumocephalus. The symptoms developed 30 minutes after lumbar interlaminar epidural injection with mepivacaine and dexamethasone. Brain CT revealed multiple small foci of air in the subarachnoid space and ventricle. Two days after initiating symptomatic treatment, the patient's symptoms completely resolved. Because pneumocephalus was observed in these three cases,[6–8] inadvertent dural puncture might have occurred during the procedure. Although there were no findings indicative of pneumocephalus in our case, there was a high risk of unintended intrathecal entry of the injected solution. In addition, a mixture of lidocaine, hyaluronidase, and placenta hydrolysate was used for cervical TFESI. Therefore, which component of the injected solution induced the chemical meningitis remains unclear.

Chemical and bacterial meningitis cannot be easily differentiated because their symptoms and laboratory findings are similar. Moreover, the CSF culture results are available after a few days.[14] A previous study showed that the symptoms of bacterial meningitis usually develop 2 to 10 days after the procedure, and those of chemical meningitis develop within a few hours.[15] The only significant difference between the two disorders is the duration from epidural injection to onset of symptoms. In our case, because the patient's meningitis symptoms appeared about 2 hours 30 minutes after the cervical TFESI, we considered that our patient had chemical meningitis and therefore did not administer antibiotics. However, because the course of each disorder is not fully elucidated, clinicians should initiate empirical treatment with broad-spectrum antibiotics until the CSF culture results are available.[8]

In summary, we have herein reported a case of chemical meningitis that developed after TFESI. Intrathecal injection might have been conducted inadvertently. Hence, clinicians should be knowledgeable about the risk of this complication. In addition, the sensitivity and specificity of physical signs of meningeal inflammation, such as Brudzinski's and Kernig's signs, are not high enough to accurately rule in or rule out meningitis. Therefore, when patients complain of meningitis symptoms such as headache, neck stiffness, and nausea/vomiting after epidural injection, the occurrence of chemical meningitis should be considered even in the absence of physical signs of meningeal irritation, and CSF analysis with empirical antibiotic treatment should be initiated as soon as possible.

Ethics

The study protocol was approved by the Institutional Review Board of Yeungnam University Hospital. The patient provided written informed consent.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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