

EPIDURAL HEMATOMA AFTER PARASAGITTAL INTERLAMINAR CERVICAL EPIDURAL STEROID INJECTION: A CASE REPORT

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Background: Cervical radiculopathy and radiculitis cause neck pain and conservative treatments are the first step. A cervical epidural steroid injection (CESI) can help if other treatments fail, but it could have side effects and serious complications. This case report describes a rare complication (epidural hematoma) of parasagittal interlaminar CESI (PCESI).

Case Report: A 62-year-old woman, candidate for the right PCESI, complained of unrelieved pain in the injection site after the procedure. Due to a decrease in movement, sensation, and muscle force, epidural hematoma was suspected. She was transferred to the hospital. In magnetic resonance imaging, a hematoma was evident. After 72 hours under surveillance, the hematoma was absorbed, and she fully recovered.

Conclusions: Epidural hematoma is an infrequent complication of CESI. This report may be an alarm to consider this complication, specific to this technique, which may be due to vascular anatomy.

Key words: Parasagittal interlaminar cervical epidural steroid injection, epidural hematoma, cervical radiculopathy, cervical radiculitis

BACKGROUND

Neck and upper limb pain are often caused by cervical radiculopathy and radiculitis, identified by pain spreading in a dermatomal pattern along with numbness, weakness, and/or reflex changes. The incidence rate of cervical radiculitis-related pain has been reported as 83 per 100,000 individuals in the United States (1,2).

The first step in managing cervical radiculopathy is conservative management. These conservative treatments include lifestyle modification, medications (e.g., nonsteroidal anti-inflammatory drugs [NSAIDs], neuroleptic agents, and acetaminophen), acupuncture, physiotherapy, and cervical orthoses. Cervical epidural steroid injection (CESI) is usually kept for intractable cases (3).

While the long-term benefits of CESI may be uncertain, it can be a suitable option for patients unwilling to have surgery or unsuitable for surgical procedures (4).

Studies (2,5-10) have shown that injections for pain relief have a success rate of 64% to 76%. While these injections are generally safe, there have been reports of side effects. Complications are rare but can occur due to spinal nerve injury, dural puncture, and infections. Mild side effects, such as facial flushing, erythema, dyspnea, nausea, vomiting, dizziness, hypotension, and temporary neck stiffness, may also occur (2,5-10).

It is important to note that CESI carries a risk of serious vascular injury due to the presence of vessels. Various studies (11,12) have shown that this can lead to severe complications, such as spinal cord vascular injury, which

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can cause anterior spinal artery syndrome, infarction, and even death.

This study reports a case that developed rare complications, such as epidural hematoma after parasagittal interlaminar CESI (PCESI).

The written informed consent obtained from the patient and this study was in accordance with institutional guidelines.

CASE PRESENTATION

A 62-year-old woman visited the pain clinic complaining of chronic pain in the neck, occiput, shoulders, and right arm. Her diabetes was managed with metformin. She had a history of breast cancer and was treated with a mastectomy. She reported herpes zoster years ago. The patient had trigeminal neuralgia, which was controlled by the radiofrequency of the trigeminal nerve. Also, she was under treatment for postherpetic neuralgia with oral medication (pregabalin). She had no history of using anticoagulant drugs. She used no other prescribed or over-the-counter medications. Her allergy and habitual history were not remarkable. The patient's physical examinations were insignificant. Motor examination of the head, neck, shoulders, and upper extremities revealed a normal range of motion and muscle strength. Sensory examination of the affected area and comprehensive neurological evaluation were unremarkable.

Magnetic resonance imaging (MRI) was conducted. In the MRI, a mild central and right paracentral protrusion in C5-C6, C6-C7, broadbase bulging at C4-C5, C5-C6, and C6-C7 were evident.

Although she had been treated with oral medication, such as NSAIDs, pregabalin, and physiotherapy, the pain was recurrent. Due to severe and chronic pain and no response to conservative management, the patient was a candidate for receiving C7-T1 PCESI.

The procedure was performed with the patient in the prone position, after prepping and draping, under local anesthesia, intravenous sedation, fluoroscopic guidance, and loss of resistance technique, using a 19G Tuohy epidural needle, the epidural space was identified and the needle tip's position confirmed by injecting 1.5mL of contrast agent. Then 16 mg of dexamethasone was diluted in 6 mL of normal saline and was injected epidurally by a physician who was an expert in interventional spine and pain procedures. The patient experienced no adverse events during the injection. Finally, she was transferred to the recovery room. In the recovery

room, she complained of pain in the injection site. The pain did not relieve after 15 minutes. As a result, 1g of paracetamol was diluted in 100 mL of normal saline and administered intravenously. Subsequently, the pain did not alleviate after 15 minutes. As a result, a muscular spasm was suspected. Thus 2.5 mg of diazepam was prescribed, but no pain relief was observed. Within minutes, the patient reported a right upper extremity sensory deficit. On manual muscle testing (MMT), strength in the right upper extremity was graded as 3/5, indicating moderate weakness. Given the concern for a hematoma, the patient was emergently transferred to the hospital for further workup. Two hours postprocedure, the patient was admitted to the hospital and a cervical spine MRI without contrast was performed. In MRI, at right-posterior aspect of cervical cord in C4 to T1 level, there is a fluid-intensity dural-based lesion with about 67-mm length and 4-mm thickness with pressure effect on cervical cord from right-posterior aspect, which is isosignal to cord in T1 sequences with convex border and could be suggestive of epidural hematoma and is shown with white arrows in Fig. 1 (axial view at C6 level) and Fig. 2 (sagittal view).

A neurosurgery consultation was requested, and based on the consultation, close neurological monitoring was implemented with examinations every 30 minutes due to the hematoma being on one side and no decline in Glasgow Coma Scale (GCS). The following morning, motor strength improved from 3/5 to 4/5 on MMT, and sensory function returned to normal. An MRI performed 72 hours after the event showed a significant reduction in the size of the hematoma. The patient made a full neurological recovery. Follow-up phone calls were made at one and three months postprocedure to assess for any sensory or motor deficits, and no clinical problems were identified.

DISCUSSION

In the current study, we report a rare complication following parasagittal interlaminar PCESI.

Epidural injections have been in use since 1901 to treat low back and cervical pain. Over the past century, the technique has been improved, and corticosteroids have become a standard component of these injections for the past 50 years. The effectiveness of epidural injection of corticosteroids in treating low back pain, sciatica, and neck pain is well-established (13).

The first recorded use of epidural injection in 1901 was cocaine injected to relieve sciatica. The procedure

was further developed in 1925 by Viner (14).

According to reports, corticosteroids were first injected into the epidural space as a treatment for acute and chronic low back pain. Many consider CESI an effective therapy for patients with limited options. Most patients, ranging from 64% to 76%, have reported experiencing a subjective improvement in their pain. However, due to the cervical spinal cord's proximity and the rich vascular plexus in the area, it is also considered to carry a higher risk (4,14). CESI is mainly performed either by fluoroscopically guided interlaminar or transforaminal (TF) approaches (2,15). The TF method carries serious risks, including arterial spasms, dissection, nerve trauma, and even death. It is crucial to use continuous fluoroscopic imaging with digital subtraction angiography and nonparticulate steroids in the neck area. Safer techniques are recommended due to these serious risks (16). As a result, other approaches like interlaminar have recently been used. The interlaminar CESI could be administered in various approaches like parasagittal and midline.

In a clinical trial with 80 patients, the parasagittal interlaminar approach for ESI was found to be more precise and effective in reducing pain, with fewer complications compared to the TF approach. Therefore, the parasagittal method is considered safer and more effective (17). A study (16) of 56 low back pain patients found that PCESI is more effective than the midline approach for reducing radicular pain, providing better drug delivery and higher pain relief. In a study conducted by Hashemi et al (18), 26 patients suffering from unilateral radicular pain in the upper extremity were examined. The results of the study confirmed the findings of a previous study.

Despite the high efficacy, there are complications attributed to interlaminar ESI. The majority of these complications are minor, with no severe consequences. These minor



Fig. 1. Axial view of the cervical spine MRI at C6 level. (Hematoma is pointed by arrow head).

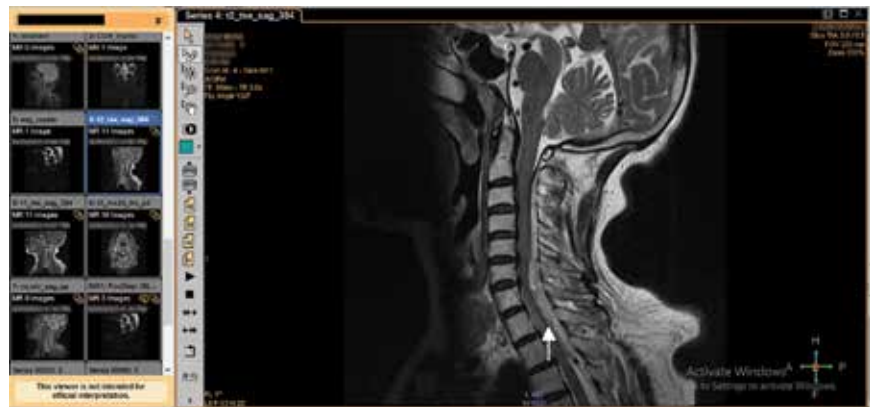


Fig. 2. Sagittal view of the cervical spine MRI. (Hematoma is pointed by arrow).

complications comprise dural puncture headache, neck pain and stiffness, intracranial hypotension, vasovagal reactions, and steroid-associated adverse reactions, including facial flushing and positional headaches (7,9,19-23). Other more severe complications include spinal cord injury, epidural abscess, and epidural hematoma (22).

It has been reported that the occurrence of epidural hematoma following any epidural anesthetic procedure is 1 in 190,000 (24). However, the exact incidence of hematoma following interlaminar CESI was not determined. The only available sources in the literature are case reports.

After reviewing the reported cases, we observed that most cases initially presented with progressive symptoms, such as pain, numbness, and weakness (24-30). The initial manifestation of the presented case was unremitting pain followed by a decrease in sensation and muscle force.

Various risk factors have been attributed to developing hematoma, including multiple cervical epidurals, an-

tiplatelet therapy, anticoagulant therapy, and multiple attempts for injection (27,28,31). Other risk factors for developing epidural hematoma include hemophilia, vascular malformations, trauma, neoplasia, cocaine abuse, any spinal surgery or manipulation, older ages, female gender, NSAIDs, and thrombolysis after myocardial infarction (31-40). The discussed case used metformin and pregabalin. Although there is no clear evidence of pregabalin affecting the risk of epidural hematoma, there have been animal studies (41) indicating that the histopathological changes related to subarachnoid hemorrhage in rats attenuated after using high doses of pregabalin via anti-inflammatory effects. Furthermore, the effects of metformin on epidural hematoma are not thoroughly clear. In an animal study, Zhang et al (42) evaluated the impact of metformin on subarachnoid hemorrhage in rats. They concluded that metformin decreases early brain injury (42). Consequently, it seems that these 2 drugs impose no further risk of developing epidural hematoma. Besides the mentioned drugs, our case used no other medications. Except for the advanced age, consuming NSAIDs, and female gender, our case also had no recognizable risk factor.

If left untreated, resultant epidural hematoma can lead to irrecoverable consequences. The management of the epidural hematoma depends on the severity of clinical manifestations. In managing subdural hematoma, 3 treatment options exist, including surgical evacuation, conservative medical management, and percutaneous drainage. If only mild deficits are present, conservative management is reasonable. However, in the face of clinical deterioration or severe motor/sensory deficits, surgical evacuation is advised (43). Percutaneous drainage may be considered in cases where the hematoma is located dorsally and in the absence of coagulopathy (44,45). In our case because of the mild neurological deficits, alleviating of the symptoms, and no decline in GCS, in the neurosurgery consult, conservative management were recommended.

Research (44) shows that conservative therapies alone lead to better neurological recovery (86%) compared to surgical interventions (47%). Considering the higher rate of neurological recovery and the symptoms of the presented case, conservative management was a reasonable approach.

This case report contributes significantly to the evolving understanding of PCESIs by presenting a potential

association with a rare but serious complication, cervical epidural hematoma. Notably, with the authors' extensive experience (> 15 years) whose been utilizing the midline interlaminar CESI (MLCESI) technique without encountering this complication, strengthens the argument for further investigation on the safety profile of parasagittal technique. This report underscores the importance of vigilance and meticulous documentation when employing the parasagittal technique. By highlighting a potential risk factor, this case report paves the way for future research aimed at elucidating the comparative safety profiles of PCESI and MLCESI.

In this case, the hematoma was successfully treated without the need for surgery. Spinal epidural hematomas are typically caused by spontaneous venous bleeds, often occurring in individuals with coagulopathy or overanticoagulation. These hematomas are located between the theca and the periosteum, known as the extradural neural axis compartment. The bleeding may come from either venous or arterial sources. Arterial bleeding poses a greater clinical threat and usually requires surgical intervention for hemorrhage control. On the other hand, venous bleeding, as potentially seen in this case, can often be managed conservatively, as bleeding from a low-pressure venous system may not expand quickly and cause compression (46).

CONCLUSIONS

It is suggested that there may be a complication specific to the technique, where the blood vessels, especially the veins, are at a higher risk of perforation, resulting in the formation of an epidural hematoma. However, further investigation, possibly through a thorough review of the literature, is needed to determine how often this complication occurs.

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We would like to thank anyone who contributed to this study. Patients' perspective: Following a CESI for chronic neck pain, I developed acute, severe neck pain and extremity weakness, prompting immediate evaluation at a health care facility. Subsequent imaging revealed an epidural hematoma in the cervical spine, which fortunately resolved spontaneously. Data availability: the data of the case is available via inquiries from corresponding author.

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