

A Case of "Foot Drop" Following Combined Spinal Epidural Anesthesia

H Uzunlar, E Duman, A Eroglu, B Topcu, N Erciyes

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Abstract

We describe a case with a 50-yr-old, healthy woman who developed neurological symptoms associated with left foot drop following Combined Spinal Epidural Anesthesia (CSEA) for right total knee arthroplasty. She complained of paresthesia and pain during insertion of the 27-G, atraumatic spinal needle which was believed to be introduced at the L₂₋₃ interspace after the 18-G epidural needle. However, when the spinal needle was withdrawn about 1-2 mm her symptoms immediately dissappeared. Although the intraoperative period was successful and uneventful, 2 hours after the end of surgery, the patient said that she was unable to move her left foot. She had little pain and her operated leg was able to move easily once the motor blockade of spinal anesthesia was entirely regressed.

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INTRODUCTION

Since serious neurologic complications related to neuraxial blocks are rare, these have previously been described primarily in case reports and retrospective surveys. To contribute to the literature, we also report a case of a unilaterally foot drop following CSEA. To our best knowledge, this report is the first reported case of foot drop after CSEA for total knee replacement due to injury of nerve roots without signs of other pathologies in the MRI. Our patient suffered from neurologic complication after CSEA and reported that she had paresthesia and pain during the needle placement but not during the injection. We compare causes, development and clinical course with those of the cases previously reported in the literature.

The frequency of paresthesia either during or after spinal anesthesia may have increased since the introduction of CSEA techniques ^{1,2,3,4,5}

Neurological complications during or after central neural blocks including combined spinal epidural anesthesia (CSEA) are rare, but if they occur, the consequences may be disastrous. When neurological complications occur, it is usually considered that the neural block is the reason until

proven otherwise.

CASE REPORT

A healthy 50-yr-old woman was scheduled for right total knee arthroplasty under CSEA. She had no known medical history, and her preoperative neurologic examination was normal. After a written informed consent and an overnight fast, she was premedicated with IM midazolam 3 mg 45 minutes before the anesthesia. In the operating room, a 16-G IV access was obtained and the usual monitoring (electrocardiography, pulse oximetry, and noninvasive blood pressure monitoring) was initiated without any remarkable findings. 1,000 ml of Ringer's lactate solution was infused. Her baseline blood pressure and heart rate were noted to be 130/85 mmHg and 90 bpm, respectively. By use of an aseptic technique, with the patient in the right lateral decubitus and slight head-up position, the combination of a spinal and a continuous epidural block using a needle through needle technique (Escopan ; Braun Melsungen, Melsungen, Germany) was used. Following an unsuccessful attempt at the L₃₋₄ interspace, CSEA was accomplished with an 18-G Tuohy needle placed in the L₂₋₃ epidural space with the bevel directed cephalad via the midline approach using the loss of resistance to saline technique at the second attempt. Then, during insertion of the 27-G Whitcare pencil point spinal needle she experienced transient severe pain and paresthesia radiating throughout her back and down the left leg. When the needle was withdrawn about 1-2 mm, the

patient's complaints disappeared. There was a good flow of CSF from needle. 2.5 ml of hyperbaric bupivacaine was injected without pain and after removal of the spinal needle, the epidural catheter was then easily advanced in a cephalad direction 3 cm into the epidural space without pain or paresthesia. No drug was administered epidurally at that time. She was left on the position about 10 minutes and, thereafter, when turned to the supine position to begin the operation, a sensory block to pinprick was obtained at T₈ on the right and at T₁₂ on the left. The surgical procedure was uneventful and lasted 60 min. The hemodynamic values remained stable throughout the intraoperative period and the epidural catheter was not used.

At the second postoperative hour, the patient demonstrated that she was unable to move her left foot while she was moving her right leg easily. At this time, she stated a little pain radiating into the L₅ and S₁ dermatomes on her left leg but none on the right lower extremity. On examination, she showed weakness of left foot extension (4/5), extension of the great toe (4/5), and supination (4/5) and there was minimal motion in the left extensor hallucis longus. The flexor hallucis longus function was good. There were no sensory deficits. We removed the epidural catheter immediately and repeated the neurologic examination every 2 hours during the first postoperative day. With exception of the left foot drop, the patient's neurologic symptoms were unchanged. High dose steroid, NSAID and Gabapentin were administered to prevent traumatic inflammation. On the following day, MRI of the lumbosacral spine showed no abnormal area of high signal within the conus medullaris. An EMG showed the typical signs of acute muscle denervation and these changes suggested a motor and sensory deficit at the levels of L₄₋₅-S₁ and that the damage was central, in the cord or roots, rather than peripheral. On the fifteenth day, the symptom of pain was lost entirely and a partial healing was observed. The foot drop (strength of dorso-flexion of the left foot) improved from 0/5 to 2/5. At the end of third month after operation, the patient's foot drop had completely regressed.

DISCUSSION

CSEA provides satisfactory surgical and postoperative analgesia for total knee arthroplasty. CSEA can be performed reliably and quickly with the needle-through-needle technique.¹ An improved needle set for the needle-through-needle technique would be one with a modified Tuohy needle having an aperture at the back and a spinal needle protruding more than 13 mm beyond the Tuohy

needle. In recent years, the use of regional anaesthesia techniques for surgery, obstetrics and post operative pain management have increased in popularity. The CSEA technique has attained widespread popularity for patients undergoing major surgery below the umbilicus who may require prolonged and effective postoperative analgesia. The CSEA technique is now well established in several institutions. CSEA has the advantages of both techniques. Spinal administration of the local anesthetic guarantees a rapid onset of action, good motor relaxation, and reliable analgesia with less local anesthetic and, thus, lower overall toxicity. The epidural catheter enables the analgesic action to be prolonged by administering top-up doses, providing optimal postoperative pain therapy.^{2,3,4}

The technique of CSEA is gaining popularity, especially in labour analgesia. We could not find any large-scale survey on neurological complications associated with this technique. Norris et al.⁴ found no neurological deficits in 536 parturients after CSEA anesthesia. Their sample size is certainly too small to detect neurological complications as there have indeed been reported cases of meningitis after CSEA.

In the neuroaxis of regional anaesthesia, direct trauma to nerve roots or spinal cord may be manifested as paraesthesia that has been considered an injurious event. However; it usually implies dural penetration, as there are no nerve roots in the epidural space posteriorly. Burning severe pain in the lower back and lower extremities, dysesthesia and numbness not following the usual dermatome distribution, along with bladder, bowel and/or sexual dysfunction, are the most common symptoms of direct trauma to the spinal cord. Such patients should be subjected to a neurological examination followed by an MRI of the effected area.⁵ No anesthetic technique is entirely without risk of death or injury, and so the choice of whichever anesthesia should be considered on the inherent risk-benefit ratio in each individual patient.⁶ Needle trauma and local anesthetic neurotoxicity are the most common causes of neurologic complications related to neuraxial anesthesia. In a prospective survey from France, neurologic complications occurred in 34 patients out of 71,053 central blocks. Serious complications occurred even the presence of experienced anesthesiologists. Continued vigilance in patients who undergo neuraxial anesthesia is warranted at all times.⁷

Cheney et al examined the American Society of Anesthesiologists Closed Claims database to determine the

role of nerve damage in malpractice claims filed against anesthesia care providers. A total of 4183 claims were reviewed, out of which 670 (16%) claims involved anesthesia-related nerve injuries. Lumbosacral nerve root injuries accounted for 105 claims and spinal cord injuries accounted for 84 claims. Paresthesias during needle insertion or injection of drug and multiple attempts to perform a block were the major factors associated with lumbosacral nerve root injuries.⁸

Direct needle-induced trauma and intraneuronal injection of local anesthesia are avoidable causes of nerve injury, and fortunately severe or disabling neurologic complications are rare. A recent retrospective study of 4767 spinal anesthetic agents noted the presence of a paresthesia during needle placement in 298 (6.3%) patients.⁹ Elicitation of a paresthesia is considered to be a risk factor for a neurologic deficit. Paresthesia experienced on the needle insertion indicate contact with either the spinal cord or the nerve roots of the cauda equina, and have been shown to increase significantly the likelihood of subsequent neurological deficit.⁹ In a prospective study, two thirds of patients with neurologic complications experienced pain during needle placement or injection of local anesthesia.³ In all cases, the neurologic deficit had the same distribution as the elicited paresthesia. The needle should be replaced in the event a paresthesia is elicited to avoid the risk of nerve injury. It is safer to avoid upper lumbar interspaces at all times. Reynolds et al recently described seven cases in which neurologic damage followed spinal or CSE technique using an atraumatic spinal needle. All patients experienced pain during needle insertion. The needle used in our case was the same as those of the seven patients previously reported was a pencil point of 27-G, and similarly, this patient complained of pain and paresthesia and also experienced symptoms when the spinal block regressed. Our patient showed no MRI evidence of a lesion in the spinal cord at a level consistent with the clinical features. This indicated the probably of an injury of spinal roots. This diagnosis was confirmed with an EMG examination showing a lesion on the L_{4,5} and S₁ roots.

Epidural and spinal anesthesia are commonly associated with paresthesias, but permanent trauma to the spinal cord or nerve roots is rare. In a review of more than 10,000 patients given spinal anesthesia, 17 reported minor nerve root damage with symptoms lasting up to 1 year.¹⁰ This is consistent with the findings of several other large-scale studies.^{3,11,12} In a retrospective survey of 505,000 labor epidurals, 38 cases of nerve root injury were reported, but

only one patient remained symptomatic beyond 3 months.¹² A recent survey by Auroy et al³ found evidence of neurologic injury in 24 of 40,000 spinals and 6 of 30,000 epidurals. Most patients recovered within 3 months, but there were several cases of persistent deficits lasting beyond 3 months. Lund¹¹ reported one occurrence of unilateral leg paresis among 10,000 epidurals. When compared with neurologic deficits in the previously reported cases, our case presenting with foot drop can be classified as a temporarily neurologic deficit.

Reynolds¹³ described seven patients with persistent unilateral sensory loss at the levels of L₄-S₁, foot drop (six patients), and urinary symptom (three patients) after painful lumbar puncture at L₂₋₃. Magnetic resonance imaging showed a syrinx in the conus in six of the patients. In all cases, the syrinx was found on the same side as the persistent clinical deficit and the symptoms that had occurred at insertion of the needle. Our report also suggests that it is advisable to perform neuraxial blocks on a responsive patient to recognize more easily if any complications occur.

The term "coincident injuries" is used to refer to those injuries occurring during the time of a nerve block that either are completely unrelated or are related in an indirect fashion. Careful examination and testing may reveal the location and thus the etiology of the injury can be clarified. For example, femoral nerve injury following lower abdominal surgery is a surgical injury may often attributed to an epidural technique. Likewise, maternal injuries from childbirth, such as obturator nerve injury, may well be ascribed to the epidural. Another example of coincident injury is nerve or other tissue injury secondary to excessive pressure or duration of an intraoperative tourniquet as used in our case. It is important for the practitioner to be aware of the possibility of coincident injuries because it is likely to be encountered in the course of practice. Therefore, caution must be used in positioning and guarding a blocked extremity(ies) during and following surgery, and the extremity(ies) should be examined periodically until regression of the block. In our case, the differential diagnosis of unilaterally "foot drop" was made with not only the presence of paresthesia during placement of the spinal needle but also by using MRI and EMG examinations. MRI showed no space-occupying or traumatic lesion in the spinal cord. However, the EMG revealed signs related to radiculopathy. This means that the neurologic injury was not in the spinal cord but most likely at the spinal nerve roots.

"Foot drop" may be due to a lesion of the common peroneal nerve, L₅ radiculopathy or a partial sciatic nerve lesion, or lesions involving the lumbosacral plexus or cauda equina. The differential diagnosis of a foot drop should be carefully made considering centrally or peripherally locations of the pathology. Nerve conduction studies and EMG are of great help in localizing the site of the lesion in case that MRI doesn't show any occupying or traumatic lesions. EMG can help detect evidence of denervation in foot drop of recent onset and can also help in establishing evidence of reinnervation in more chronic lesions. In our case, we used an EMG examination because the MRI showed no lesions.

Reynolds presented the seven cases of spinal cord damage with spinal anaesthesia collected over an 8-year period, but he also estimated that there may have been at least 22.¹³ This may be a small number compared with the total number of spinal anesthetics given, but all of the patients have permanent symptoms. However, we think that some patients with neurological injury or deficit have not been published by clinicians. Therefore, we wished to contribute to literature describing this case of a foot drop.

CONCLUSIONS

Neurologic injury may develop as either needle or drug-induced complications during/after CSEA. Early signs are the existence of pain/paresthesia occurring during placement of the needle and/or injection of local anesthetic. Imaging techniques and/or electromyographic examinations may facilitate the diagnosis. Of course, the needles must be inserted gently and slowly when performing CSEA. To our best knowledge, this is the first reported case of a foot drop following CSEA for total knee arthroplasty.

CORRESPONDENCE TO

Dr. Halil Ibrahim Uzunlar Iskenderpaşa m. Deniz s. No: 29/2
61030 TRABZON-TURKEY Phone No: 00 90 462 3775543
Fax No: 00 90 462 3250518 E-mail: uzunlar@gmx.com.tr

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Author Information

Halil I. Uzunlar

Staff, Department of Anesthesiology, Karadeniz Technical University

Erdem Nail Duman

Assistant Professor, Department of Anesthesiology, Karadeniz Technical University

Ahmet Eroglu

Assistant Professor, Department of Anesthesiology, Karadeniz Technical University

Buket Topcu

Resident, Department of Anesthesiology, Karadeniz Technical University

Nesrin Erciyes

Professor, Department of Anesthesiology, Karadeniz Technical University