

Irreversible damage to the cauda equina following repeated intrathecal injection of hyperbaric dibucaine

YASUHIRO YAMAUCHI¹ and YUJI NOMOTO²

¹Department of Anesthesiology, Ehime National Hospital, Shigenobu-cho, Ehime 791-0281, Japan

²Department of Orthopedics, Ehime National Hospital, Ehime, Japan

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Introduction

Cauda equina syndrome is an uncommon but serious neurologic complication related to spinal anesthesia. It usually manifests as sphincter disturbances, altered perineal and lumbosacral sensation, and variable loss of motor power in the legs. These symptoms usually disappear in months; however, the condition may deteriorate over a prolonged period [1].

We report a case of cauda equina syndrome following repeated intrathecal injection of hyperbaric dibucaine in which the symptoms have remained for more than 1 year.

Case report

A 65-year-old woman, 155 cm in height and 50 kg in weight, was scheduled for arthroscopic surgery of the left knee joint under spinal anesthesia. She had no medical history except for bilateral gonalgia for a few years. Using a 23 G Quincke needle, the surgeon performed spinal puncture at the L4–L5 interspace in the left lateral position. Free flow of clear cerebrospinal fluid (CSF) was obtained easily. Dibucaine hydrochloride (Percamin-S), 2.2 ml of 0.3% hyperbaric solution without adjuvant, was injected into the subarachnoid

space. Although the patient was deliberately kept in the same position for 30 min to acquire hemilateral anesthesia, only a hot sensation was obtained in her sacral region. Fifty minutes later, the second subarachnoid puncture was performed by the anesthesiologist at the L3–L4 interspace, and 2.0 ml of the same drug was injected. There was no paresthesia or pain during insertion of the needle or injection of the drug in either procedure. Ten minutes later, a T10 sensory block height was obtained in the left side, and she was changed to the supine position. The operation was then started in the knee-arthroscopic position. The proposed operation was completed uneventfully in 1 h. At the end of the operation, the analgesic level remained at T10 height on both sides. There was no episode of hypotension during or after the operation.

On the first postoperative day, the patient complained of urinary and bowel difficulties with numbness in the perineal region. Sensory and motor functions in the lower extremities were normal. A urinary catheter was inserted and laxatives were administered for sphincter disturbance. On the second postoperative day, she could urinate with manual compression of the bladder. She was discharged on the 14th postoperative day without any improvement in these symptoms.

One month later, the patient consulted the anesthesiologist about persistent symptoms. She could urinate with slight difficulty at this time, but she could not defecate, even if she applied full stress on her abdomen. She often had bowel incontinence after taking laxatives for constipation, which made her depressed. Magnetic resonance imaging (MRI) showed no abnormality in the lumbar spine. Cauda equina syndrome related to spinal anesthesia was diagnosed. Three months later, she had recovered most of her urinary function, but her bowel function and perineal numbness did not show any improvement. One year after the operation, these neurological deficits remained unchanged.

Discussion

Cauda equina syndrome related to spinal anesthesia occurs when the lumbosacral nerve roots are injured by trauma, ischemia, infection, compression, surgical position, contamination of local anesthetics, or direct local anesthetic neurotoxicity [2,3]. The symptoms and prognosis depend on the extent of damage to the nerve tissue. In this case the symptoms of sphincter disturbance (constipation) and perineal numbness were consistent with this syndrome and continued for more than 1 year.

The toxicity of hyperbaric dibucaine was thought to be a main cause of cauda equina syndrome in this case, because other possible factors were negligible. There was no needle trauma and no general or local spinal cord ischemia during the postoperative period. There was no sign of infection of the central nervous system. Mechanical compression of the spinal cord, caused by hematoma or orthopedic diseases, was not visible on lumbar MRI. Contamination of local anesthetics with detergents or other chemicals was unlikely, because all procedures were performed under sterilized conditions. It has been demonstrated that the cauda equina is stretched in the lithotomy position, which might cause transient neurologic symptoms (TNS) or transient radicular irritation (TRI) [4,5]. In some prospective studies on TNS or TRI, the same symptoms occurred after knee arthroscopic surgery under spinal anesthesia [6–8]. However, although it is unlikely that the knee arthroscopic position was the sole cause of this persistent nerve damage, it could have been one of the causative factors.

Every local anesthetic has dose-dependent neurotoxicity. At clinically used concentrations, dibucaine has stronger neurotoxicity than other available anesthetics [9,10]. It has not been used for spinal anesthesia in the United States and European countries for a long time. Ogawa et al. demonstrated that the desheathed cervical vagus nerve of the white rabbit was electrophysiologically and histologically destroyed by 0.03% dibucaine in 1 h. They also showed that dibucaine was 10 times more toxic than bupivacaine as a local anesthetic in the same model [11]. Despite these facts, dibucaine derivatives are widely used for spinal anesthesia in Japan, and there have been a few case reports of neurologic complications from these drugs [12]. We cannot fully explain this discrepancy; however, adverse effects might be discarded or overlooked in usual clinical practice because of their rarity [13]. A private letter from a drug company to the first author stated that there were two or three claimed cases of neuropathy due to these drugs every year. Unfortunately we could not use bupivacaine, which is less toxic than dibucaine, as a spinal anesthetic when this case occurred in 2000.

Recently Auroy et al. collaborated with many anesthesiologists on a prospective study of serious complications related to regional anesthesia. In 40,640 cases of spinal anesthesia, there were 7 cases of radiculopathy and 5 of cauda equina syndrome after uneventful spinal anesthesia [14]. There are also some closed claim studies of cauda equina syndrome caused by local anesthetics [3,13]. These cases were thought to be no-fault claims.

Another important issue is that we performed spinal injection twice in this case. Drasner and Rigler cautioned that repeated injection after a “failed spinal” could be harmful [15]. Failure of the first attempt may be due to maldistribution of the drug in the caudad direction, and consecutive injections of the drug might reach a neurotoxic level around the spinal cord. However, cauda equina syndrome can occur after a single “successful spinal” [3,13,14,16]. It is difficult to say that this complication would not have occurred if the second injection had not been performed. In the future we must use less toxic local anesthetics than dibucaine, and more profound consideration should be given to what we should do after a “failed spinal.” Moore et al. recommended that to avoid cauda equina syndrome, the operating table should be tilted in the 5–10° Trendelenburg position when hyperbaric solutions are used, so that the solutions are not pooled in the caudad portion of the dural sac [17].

We reported a case of cauda equina syndrome following repeated injection of hyperbaric dibucaine in which the symptoms have continued for more than 1 year. Since dibucaine has strong neurotoxicity, it probably caused irreversible damage to the cauda equina in this case. We should use less toxic drugs for spinal anesthesia, especially after a “failed spinal.”

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