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CASE REPORT

A Complication of Epidural Catheter Administration: Pneumocephalus and Related Diplopia

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Abstract

Intracranial hypotension may occur after lumbar puncture, spinal anesthesia, and craniospinal trauma. Complications such as orthostatic headache, neck pain, photophobia, tinnitus, nausea, and diplopia are frequently seen in these patients. Complications such as air embolism and pneumocephalus can also be seen in the methods used to determine the epidural space. We aimed to present the postoperative complications and the process in our patient in whom we attempted to insert an epidural catheter to provide intraoperative anesthesia and postoperative analgesia in radical prostatectomy surgery.

Keywords: Diplopia; epidural catheter; intracranial hypotension; pneumocephalus; postoperative analgesia.

Intracranial hypotension consisting of visual and hearing symptoms and headache triad may be observed after lumbar puncture[1]. In these cases, the 6th cranial nerve (N. abducens) is affected more than other cranial nerves. It was previously thought that the N. abducens was sensitive to brain displacement and traction due to its long course in the head. According to recent data, the N. abducens emerges from between the medulla oblongata and the pons, rises upwards, crosses the basilar arteries, pierces the dura, and curves at an acute angle over the prominence of the petrous apex of the temporal bone. As a result, in cases of intracranial hypotension causing brain displacement, the N. abducens may be compressed under the pons in the regions where it makes an angle with the dura and petrous process[2].

Diplopia may develop at a rate of 1/300-1/8000 after spinal anesthesia[3]. The incidence of abducens nerve damage can be reduced as a result of developments such as atraumatic structures of the needles used, reduction of needle diameters, and application of different anesthesia techniques[4].

In epidural anesthesia, neurologic and systemic complications related to the drug, application technique, and catheter use are observed[5]. Complications such as air embolism, cauda equina compression, pneumocephalus, and inadequate analgesia may be observed in the method in which air is used for the determination of the epidural space[6].

We wanted to share our patient who developed diplopia and pneumocephalus complications following the difficulty we encountered during epidural catheterization.

Case Report

A 61-year-old ASA III patient scheduled for radical prostatectomy and bilateral lymph node dissection was

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taken to the operating room. After routine monitoring (ECG, NIBP, SpO_2, HR), epidural catheter insertion was planned in the sitting position for postoperative analgesia. The application site was cleaned according to asepsis rules and equipment preparation was performed under sterile conditions. The procedure was started using the hanging drop technique with a Touhy needle from the L3-4 interval. The needle was inserted into the intervertebral space in the lateral position, the mouth opening was turned upwards, and a saline drop was suspended behind it with a syringe. While the Touhy needle was advanced very carefully, there was no resistance or anatomical obstacle, CSF (Cerebrospinal Fluid) started to come out of the Touhy needle in a gushing manner at a short distance, and the procedure was quickly terminated and a compressive compress was applied.

Two to three minutes later, the procedure was repeated, and when the same picture was encountered, the procedure was performed for the last time from the upper intervertebral space using the air-resistance technique. The epidural space was tried to be detected by advancing the Touhy needle with the plunger of the injector with tiny pressures. The needle advanced without resistance at all distances, but rapid CSF flow was seen again. Intravenous patient-controlled analgesia was planned and the procedure was terminated.

The operation lasted approximately 115 minutes under general anesthesia. He was followed up in the recovery unit for 60 minutes and then sent to the ward. The patient developed diplopia on the 3rd postoperative day and air values were detected in both lateral ventricle frontal horns on brain CT (Computerized Tomography) and diffusion MRI (Magnetic Resonance Imaging) (Figs. 1-3). Brain CT was evaluated as pneumocephalus and intracranial hypotension. There was no loss of muscle strength or hemodynamic disturbance except diplopia. Ample hydration, bed rest, and analgesics were recommended. The patient and his relatives were told that it might be a transient complication due to the epidural procedure. The patient's relatives did not accept the lumbar puncture

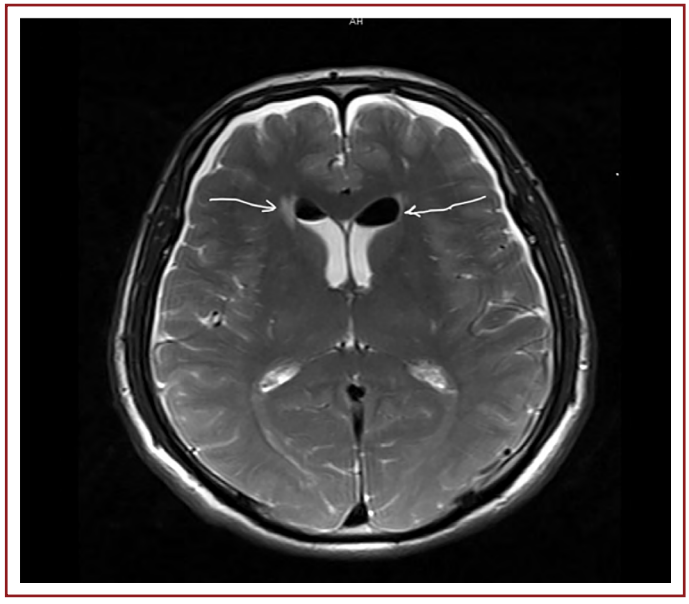

Figure 2. Hypodense air densities showing leveling within bilateral lateral ventricles on MR. Contrast enhancement on leptomeningeal surfaces.
MR: Magnetic Resonance Imaging.

Figure 1. Intraventricular air values at the level of the bilateral lateral frontal horn on CT.
CT: Computerized tomography.

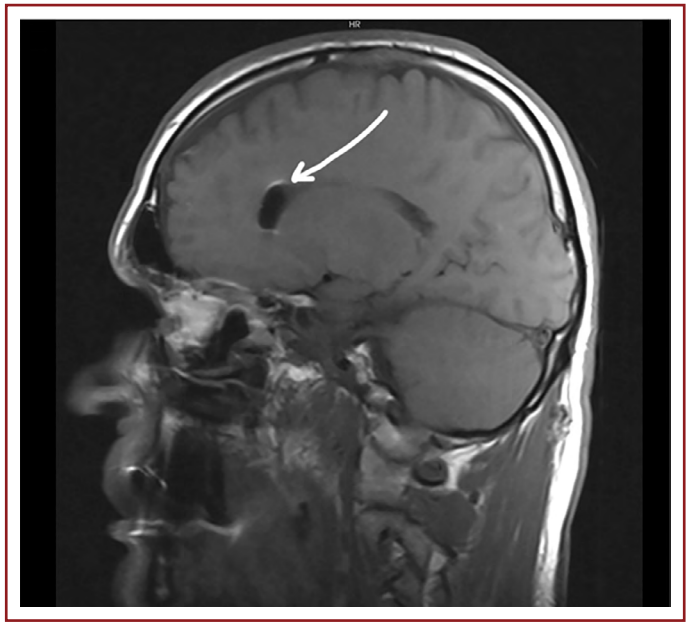

Figure 3. Air image in the lateral ventricle frontal horn on MR.

(LP) procedure requested for macroscopy and culture. Intravenous ampicillin was started prophylactically. Diplopia resolved on postoperative day 8, and the patient was discharged on postoperative day 18 with improvement. No pneumocephalus was observed on control MRI.

Discussion

Before radical prostatectomy surgery, epidural catheter placement was planned before general anesthesia for intraoperative and postoperative analgesia[7]. The catheter could not be placed because of problems during the procedure. Postoperative findings suggested intracranial hypotension and complications related to catheter placement.

Intracranial hypotension may develop after lumbar puncture, spinal anesthesia, and craniospinal trauma. Orthostatic headache, neck pain, photophobia, tinnitus, nausea, and diplopia are frequently observed in the clinic[1]. Despite the production of less traumatic and finer diameter needles, diplopia can be observed rarely after spinal anesthesia[4]. In 80% of these patients, diplopia resolves spontaneously in periods ranging from 2 weeks to 8 months[8]. It has been reported that intracranial hypotension that occurs during spinal anesthesia causes nerve tension and consequently ischemia and loss of function[9].

In the postoperative period, CSF leakage is prevented by keeping the patient in the supine position, and intracranial hypotension can be prevented[4]. CSF volume can be increased with fluid replacement and caffeine. Nerve damage can be treated with epidural blood patch application within 24 hours after diplopia develops, and thus diplopia and headache may improve[10]. MRI is important in the diagnosis of intracranial hypotension because it shows cranial and spinal pathologies, and meningeal thickening is common[1]. CT should also be performed to rule out conditions such as cerebral hemorrhage[11]. In our patient, CT and MR imaging showed hypodense air densities (pneumocephalus) leveling in bilateral lateral ventricles and contrast enhancement on leptomeningeal surfaces (Figs. 1- 3).

In epidural anesthesia, neurologic and systemic complications related to the drug, application technique, and catheter use are observed[5]. Complications such as air embolism, cauda equina compression, pneumocephalus, and inadequate analgesia may be observed in the method in which air is used to determine the epidural space, as in our case[6]. Although the most common cause of pneumocephalus is head trauma, it may occur after neurosurgical procedures performed in the sitting position and for many different etiologic reasons[12]. Pneumocephalus may rarely develop in intracranial, epidural, subdural, subarachnoid, and intraparenchymal areas after LP[12].

During LP, air passing from the spinal region to the subarachnoid space enters the intracranial and subarachnoid space through the foramen Luschka and foramen Magendie by moving cephalad[13]. Pneumocephalus after LP develops more easily in the lateral position. Because intrathecal pressure is lower in the area where LP is performed, air passage to the intrathecal area is easier. During lumbar drainage, air enters the intracranial cavity via the intraspinal route from the puncture site due to the negative pressure difference between the intracranial and intraspinal subarachnoid distances and excessive drainage[14]. Elevation of the patient's head emphasizes the CSF pressure gradient between compartments and facilitates the development of pneumocephalus[15]. We performed the catheter application in the sitting position and with the hanging drop technique, but we encountered CSF drainage in a gushing manner. In the last attempt, we used air in the application method with the belief that the epidural space could be detected more easily. We believe that pneumocephalus developed during this process due to the pressure differences between the compartments.

Common findings of pneumocephalus include headache, confusion, hemiparesis, disorientation, and anisocoria, which vary according to the volume of air introduced into the subarachnoid space[12]. In our patient, diplopia developed without headache despite developing pneumocephalus.

CT is the most useful diagnostic method in the differential diagnosis, as we also used[13]. Symptoms may improve in two weeks with head elevation, hyperbaric oxygen therapy, fluid loading, caffeine, prophylactic antibiotics, and analgesia[12]. Improvement of symptoms is related to the absorption of intracranial air[8]. In our case, symptomatic treatment was applied because of the common mechanisms in the development of diplopia and pneumocephalus, common approaches in treatment, and the mild course of the findings. He had no complaints for about ten days after diplopia resolved, pneumocephalus was thought to have regressed, and the patient was discharged with recovery. No pneumocephalus was observed at follow-up.

We wanted to re-emphasize that patients should be followed up closely and prepared for complications due to early complications in analgesia and anesthesia methods.

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