Pneumocephalus following spinal anaesthesia for spine surgery

Sir,

Pneumocephalus has been described subsequent to the detection of epidural space with loss of resistance to air technique. There are very few reports of pneumocephalus following spinal anaesthesia. We noted a case of pneumocephalus following spinal anaesthesia administered for laminectomy.

A 53-year-old male with diagnosis of L5-S1 prolapsed intervertebral disc and was posted for laminectomy and discectomy. He was a known hypertensive on amlodipine and telmisartan for control of blood pressure. His pre-operative blood pressure was about 160/96 mm of Hg. Spinal anaesthesia and need for prone position during the surgery was explained to the patient. Standard monitoring with electrocardiography, non-invasive blood pressure, and pulse oximeters was established. Dural puncture was attempted with 25 gauge Quincke needle in L4-5 space, but could succeed only on 4th attempt due to technical difficulty (first 2 attempts by postgraduate student). After noting the free flow of cerebrospinal fluid (CSF), 3.2 ml of 0.5% hyperbaric bupivacaine along with 90 μg of buprenorphine was given. The table was maintained in neutral position and subarachnoid block was established up to T8 level. Patient was positioned in the prone position 10 min after the block and level was confirmed to be T8. Intra-operative hypotension (up to 100/56 mmHg for about 10 min) was treated with boluses of ephedrine and mean blood pressure was maintained above 70 mm of Hg throughout the perioperative period. Even though the patient was cooperative, he was taking deep breaths due to anxiety. Surgery was uneventful and there was no obvious dural damage during the surgery. Patient was comfortable and haemodynamics were stable in the post-operative care-unit. Four hours after the surgery, the patient was restless, complained of weakness of right upper limb and was not able to talk. Examination by neurophysician confirmed the monoparesis and aphasia and no other neurological deficits. Magnetic resonance imaging of brain was performed, which revealed acute infarcts in fronto-parietal and temporal areas corresponding to the distribution of middle cerebral artery [Figure 1]. Along with this, pneumocephalus was noted in the left sylvian fissure and basal cisterns, which was seen compressing the middle cerebral artery branches, which lead to the infarction [Figure 2]. He was observed in Intensive Care Unit with oxygen by face mask. About 10 h postoperatively, patient started vocalising and after about 15 h postoperatively, power returned in the monoparetic limb. By next day, the patient was comfortable without any neurologic deficits. Computed tomography scan performed after 2 days showed complete reabsorption of pneumocephalus. He was discharged from the hospital without any neurological deficits.

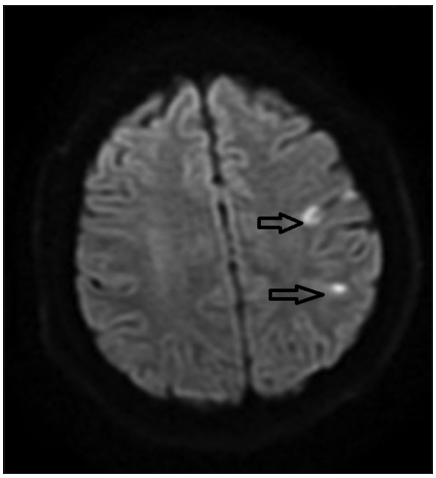

Figure 1: Magnetic resonance imaging of the brain showing acute infarction in Broca's area and post-central gyrus (indicated by arrows)

Spinal anaesthesia is an effective alternative to general anaesthesia for lumbar spine surgery and has a reduced rate of minor complications.[1] It is common practice in our centre to perform single level discectomy surgeries under spinal anaesthesia in cooperative patients. In this patient, multiple punctures were done due to difficulty in getting the subarachnoid block. Normally, dural rents will be covered by the soft tissues of the back, but in our patient, surgical exposure for laminectomy possibly exposed the dural rents to atmospheric air. Animal studies have shown that CSF pressure can vary similar to hydrostatic pressure and lumbar CSF pressure can be negative in different body positions.[2] Lumbar CSF being at higher level than right atrium in prone position is expected to have very low, if not negative, pressure. Furthermore negative intrathoracic pressure during deep inspiration can lead to decrease in subarachnoid pressure below the atmospheric pressure.[3] As our patient was breathing spontaneously in prone position, we hypothesise that spontaneous ventilation with negative pressure in the subarachnoid space allowed air entry through

Figure 2: Magnetic resonance imaging of the brain showing multiple hypoechoic area indicating the air pockets in the subarachnoid space. Arrow indicating air pocket compressing the middle cerebral artery branches in the left sylvian fissure

the dural puncture site. Air pockets caused the compression of branches of middle cerebral artery leading to symptoms of acute infarct.

Pneumocephalus has been rarely reported following subarachnoid block. Avellanal reported a case where the patient had a series of coughs followed by deep inspiratory efforts when spinal needle was in subarachnoid space, just before the local anaesthetic was injected.[4] Patient developed pneumocephalus which was explained by deep inspiratory efforts producing negative pressure in subarachnoid space and presence of spinal needle open to atmosphere allowing entry of air. This is very much similar to our case, except that opening to atmosphere in our case was provided by the surgical exposure rather than the needle. Another case of pneumocephalus has been reported following multiple spinal injections without any obvious cause for air entry in subarachnoid space.[5]

In our patient, we could observe the air pocket compressing on the branches of left middle cerebral artery leading to the symptoms in the area of its distribution. Pneumocephalus has a tendency to resolve spontaneously and usually it is absorbed within few days. Since the amount of air entering the subarachnoid space following spinal anaesthesia is very small, it is expected to be absorbed early and hence compression symptoms resolve much faster.[5] The treatment of pneumocephalus consists on administration of 40–100% oxygen in the supine position.

Spinal anaesthesia is considered as an acceptable technique for simple spine surgeries and many cases are performed without much complication. We could not find any other case of pneumocephalus following spine surgery in spinal anaesthesia. Looking at the overall number of cases of spine surgeries done under spinal anaesthesia, this complication appears quite rare. But the possibility of pneumocephalus should be kept in mind in spontaneously breathing patient with dural rent exposed to atmosphere.

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Conflicts of interest

There are no conflicts of interest.

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