

Nitrous oxide-induced tension pneumocephalus after thoracic spinal cord surgery: a case report [Letter]

Axel R. Heller, Hermann Theilen, R. J. Litz

Angaben zur Veröffentlichung / Publication details:

Heller, Axel R., Hermann Theilen, and R. J. Litz. 2008. "Nitrous oxide-induced tension pneumocephalus after thoracic spinal cord surgery: a case report [Letter]." *Journal of Neurosurgical Anesthesiology* 20 (3): 211–12.
<https://doi.org/10.1097/ANA.0b013e31817e0f1b>.



Nitrous Oxide-induced
Tension
Pneumocephalus
After Thoracic Spinal
Cord Surgery:
A Case Report

To JNA Readership:

A pneumocephalus occurring
after spinal cord surgery in prone

position with the head level beneath the operative field is barely conceivable. We report on a unique case of a serious vigilance deficit (diminution in the capacity to maintain focus of attention) induced by a tension pneumocephalus after resection of a spinal cord tumor under general anesthesia using desflurane, nitrous oxide, and fentanyl.

A 22-year-old, 166-cm, 72-kg woman without significant comorbidities was scheduled for elective resection of a thoracic spinal cord ependymoma (Th4-5). After oral premedication with midazolam, 7.5-mg anesthesia was induced using propofol (2.5 mg/kg bw), fentanyl (2.5 µg/kg bw), and atracurium for relaxation (0.5 mg/kg bw) and was maintained by desflurane (1.8 to 2.5 vol %), nitrous oxide (60%), and repeated applications of fentanyl (cumulative dose 1.1 mg). No further relaxation was required during surgery (conventional laminectomy, tumor resection), which lasted for 3 hours. Surgery was performed in prone position using a dorsal approach. Two hours after onset of surgery, the patient presented with an increase in blood pressure, which could not be controlled by higher dosages of desflurane or fentanyl. The heart rate remained unchanged. After discontinuation of all anesthetics, the patient did not recover adequately from anesthesia, although naloxone, flumazenil, and physostigminsalicylate were applied to antagonize possible anesthetic drug-induced vigilance interactions. To identify a possible intracranial event responsible for the vigilance deficit, a cerebral computed tomography scan was performed, which discovered intracranial air bifrontally and in the parasellar region with signs of a tension pneumocephalus (Fig. 1). Subsequently, the patient was admitted to the intensive care unit to allow nitrous oxide for elimination by continued mechanical ventilation. After 4 hours, the patient recovered without further cerebral deficits. However, the patient suffered from posture-dependent severe headaches, which persisted for the next 4 days.

Vigilance deficits after spinal cord surgery have rarely been described and are most commonly

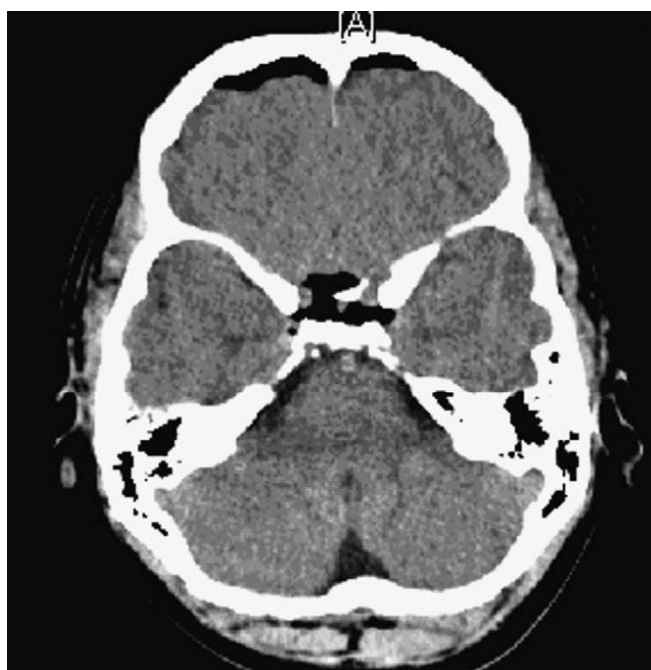


FIGURE 1. Axial computed tomography scan of the brain obtained 4 hours postsurgery showing larger amounts of air in the frontal and parasellar regions.

induced by intracranial subdural hematoma owing to a cerebrospinal fluid leakage associated with intracranial hypotension.¹ The development of a pneumocephalus after spinal cord surgery is usually restricted to operations in the sitting position and at the cervical spine.² During surgical interventions in the prone position while placing the head beneath the level of the operation field, a pneumocephalus should not be encountered owing to gravitational effects. However, according to the presented case, opening of the spinal dura, thus leading to a loss of spinal fluid, implies the risk to develop a pneumocephalus. While using nitrous oxide in this case, the possible occurrence of intracranial air trapping may thus result in a tension pneumocephalus. This finding was obviously responsible for the complex vigilance deficit in the presented case. As incidental durotomy is a frequent complication in spinal surgery,^{3,4} the described complication may not only be restricted to neurosurgical interventions, but also to all operative specialties that perform spinal surgery. The anesthetist should always be aware of this potential problem

and should immediately stop any application of nitrous oxide if taken whenever the dura has been opened to avoid a comparable and potentially life-threatening complication.

Hermann Juergen Theilen, PhD
Axel R. Heller, PhD
Rainer J. Litz, MD
 Department of Anesthesiology
 and Intensive Care Medicine
 University Hospital
 of Dresden
 Dresden, Germany

REFERENCES

1. Watanabe A, Takai H, Ogino S, et al. Intracranial subdural hematoma after resection of a thoracic spinal cord tumor. *J Spinal Disord Tech.* 2002;15:533–536.
2. Toung TJ, McPherson RW, Ahn H, et al. Pneumocephalus: effects of patient position on the incidence and location of cerebrospinal fluid leakage after posterior fossa and upper cervical cord surgery. *Anesth Analg.* 1986; 65:65–70.
3. Bosacco SJ, Gardner MJ, Guille JT. Evaluation and treatment of dural tears in lumbar spine surgery. *Clin Orthop Relat Res.* 2001;389:238–247.
4. Kane PJ, el-Mahdy W, Singh A, et al. Spinal intradural tumours: part II—intradural. *Br J Neurosurg.* 1999;13:558–563.