

## Acute Cervical Myelopathy Following Laughing Gas Abuse

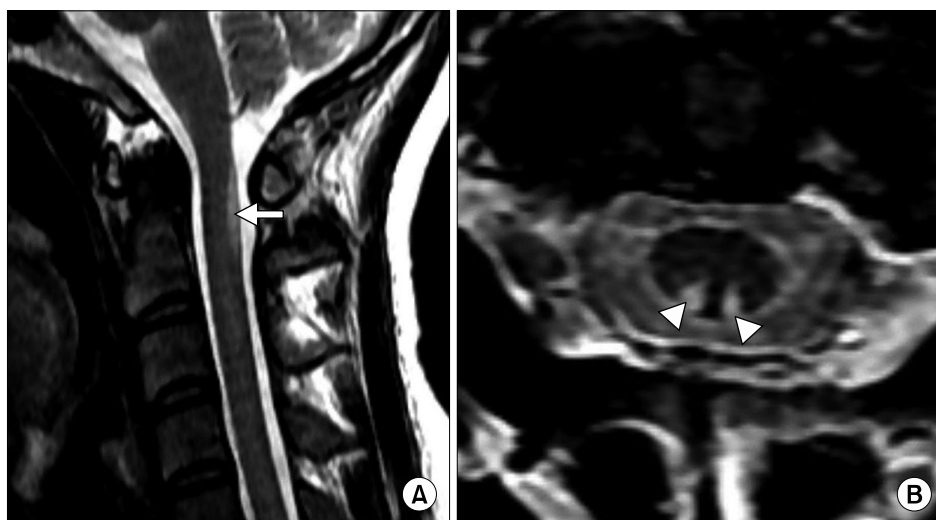
Hak-Loh Lee<sup>1,†</sup>, Seung-Jin Lee<sup>2,†</sup>, Tai-Seung Nam<sup>1,\*</sup>, Seung Hyun Min<sup>1</sup>, Jae-Myung Kim<sup>1</sup>, and Kyung-Wook Kang<sup>1</sup>

Departments of <sup>1</sup>Neurology and <sup>2</sup>Radiology, Chonnam National University Hospital and Medical School, Gwangju, Korea

A 32-year-old woman with a history of depression presented with an acute-onset gait disturbance. She could not stand without assistance. A neurologic examination revealed a positive Romberg's sign and dissociated sensory loss, which was suggestive of sensory ataxia. She had inhaled laughing gas from nearly 100 balloons to relieve her depressive mood 2 days before the onset of symptoms. A cervical MRI showed focal T2-hyperintensity at C1-2 level (Fig. 1). A cerebrospinal fluid examination was unremarkable. A serologic study showed that her hemoglobin level was 12.2 g/dL (normal range, 12-18 g/dL); MCV, 108.6 fL (80-99 fL); MCH, 35.5 pg (27-32 pg); vitamin B12, 94 pmol/L (156-672 pmol/L); homocysteine, >50 μmol/L (5-15 μmol/L). Ultimately, she was diagnosed with acute cervical myelopathy caused by vitamin B12 deficiency following the inhalation of laughing gas, and was treated with vitamin B12 replacement. The patient has been improving gradually with rehabilitation, and can stand up independently and

walk alone with an ambulatory assistance device 3 months after treatment.

Laughing gas is the common name for nitrous oxide (N<sub>2</sub>O),<sup>1</sup> and is typically used as an inhaled anesthetic agent in the field of surgery or dentistry.<sup>2,3</sup> It is also used for recreational purposes due to its euphoric effects when inhaled.<sup>1-3</sup> However, prolonged N<sub>2</sub>O abuse can lead to various neurologic manifestations including subacute combined degeneration, myeloneuropathy, or myelopathy without peripheral neuropathy due to vitamin B12 deficiency.<sup>4</sup> Vitamin B12 is an essential cofactor in the synthesis of the myelin sheath, and can be inactivated irreversibly by exposure to N<sub>2</sub>O.<sup>1,3</sup> Chronic myelopathy following long-term exposure to N<sub>2</sub>O has already reported,<sup>1,4</sup> and subacute myelopathy can also occur 2 to 6 weeks after the surgery under anesthesia with N<sub>2</sub>O.<sup>2</sup> Our patient presented with acute cervical myelopathy just 2 days after inhalation of laughing gas, which is relatively uncommon in N<sub>2</sub>O-induced



**FIG. 1.** Cervical MRI scan. Sagittal T2-weighted image shows focal linear hyperintensity (arrow) at the level of the C1-2 vertebral body (A). Axial T2-weighted image shows hyperintense lesions with an “inverted V sign (arrow heads)” within the dorsal column of the cervical cord (B).

### Corresponding Author:

Tai-Seung Nam  
Department of Neurology, Chonnam National University Hospital and Medical School, 42 Jebong-ro, Dong-gu, Gwangju 61469, Korea  
Tel: +82-62-220-6171, Fax: +82-62-236-0839, E-mail: nts0022@hanmail.net

<sup>†</sup>These authors contributed equally to this work.

### Article History:

Received January 28, 2019  
Revised February 7, 2019  
Accepted February 18, 2019

myelopathy. To our knowledge, acute post-surgical myelopathy has only been once reported after anesthesia with N<sub>2</sub>O.<sup>2</sup>

In summary, our case highlights that N<sub>2</sub>O can cause acute myelopathy by laughing gas abuse in the absence of anesthesia with N<sub>2</sub>O. Further study is needed for determining the relation between the exposure of laughing gas and onset of neurologic symptoms.

#### **CONFLICT OF INTEREST STATEMENT**

None declared.

#### **REFERENCES**

1. Coussaert C, Heylens G, Audenaert K. Laughing gas abuse is no joke. An overview of the implications for psychiatric practice. *Clin Neurol Neurosurg* 2013;115:859-62.
2. Safari A, Emadi F, Jamali E, Borhani-Haghighi A. Clinical and MRI manifestations of nitrous oxide induced vitamin B12 deficiency: a case report. *Iran J Neurol* 2013;12:111-3.
3. Chi SI. Complications caused by nitrous oxide in dental sedation. *J Dent Anesth Pain Med* 2018;18:71-8.
4. Kang SW, Hong JM, Namgung DW, Choi YC. Neurological manifestations of myeloneuropathy in patients with nitrous oxide intoxication. *J Clin Neurol* 2019;15:116-7.