A Source of Nonanesthetic Nitrous Oxide in Operating Room Air

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During the past decade, considerable interest has been focused on trace anesthetic gases in the operating room environment. Possible adverse effects on operating personnel have been suggested, but not universally accepted.¹⁻⁵ Sources of nitrous oxide leaking into the atmosphere, other than from anesthesia machines, have been a neglected area of study. N₂O is used for such nonanesthetic purposes as insufflation during laparoscopy and provision of a coolant for cryosurgical probes. N₂O used in a Frigitronic® cryosurgical probe for eye surgery vents into the operating room air from the probe jack connection to the console. Measurements were made of ambient concentrations of N₂O in the breathing zones of the surgeon, close to this connection, and the anesthetist, who sat several feet further from it.

METHODS

Levels of N₂O were measured in 25 cases of cataract extractions in which the cryosurgical probe was used. All operations were done with the use of local anesthesia, and anesthetic gases were not used. The operating rooms had a nonrecirculating supply of 15 air exchanges per hour. Therefore, the source of any N₂O found in the room air would be the cryoprobe.

A Cavitron® environmental Model EM20A infrared monitor was used for the N₂O measurements. The instrument was first zeroed with N₂O-free air sampled in an unused room, then calibrated with standard gas. The standard was certified by Matheson Corporation, Newark, California, to contain 212 ppm N₂O.

Experimental sampling was performed in a standard manner for each case. Background samples were taken in the operating room before the beginning of the first procedure of the day and during each interoperative period longer than 30 min. The operating room doors were closed, the cryoprobe N₂O tanks closed, and there was a zero pressure reading on the cryoprobe N₂O guage. Sampling was continuous for 1 min, and

the highest reading found during that time was the one recorded. The sampling tube was 50 cm from the operating surgeon’s breathing area, which was 3 feet from the cryoprobe vent. The second sample was taken from a similar location near the anesthetist’s breathing area, 6 feet from the vent. Samples were next taken when the cryoprobe N₂O system was pressurized, then after 1 min, after 20 min, at the clearing of the probe, and then 5, 10, 15, and 20 min thereafter. Further readings were taken after closing of the valves of the N₂O tanks and bleeding the tanks to zero gauge pressure, and 20 min after this, or at the end of the procedure.

RESULTS

The results are summarized in table 1. The background readings were within the calibration limits of the Cavitron monitor. During the use of the cryoprobe the N₂O levels were in the ranges of 500 ppm in the ophthalmologist’s breathing area and 90 ppm in the anesthetist’s breathing area. These levels were maintained for an average time of 34 min, with a range of

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6 to 81 min. The levels of N₂O returned to below 25 ppm in 20 min or more.

**DISCUSSION**

The National Institute of Occupational Safety and Health (NIOSH) has recommended an occupational exposure of less than 25 ppm N₂O during administration of anesthesia. This is a time-weighted average concentration, which NIOSH suggests be the average amount present over at least a 15-min period. This sampling method was not followed in the present study, since it precludes detection of minute-to-minute changes. Instead, the peak values found during one-minute sampling periods are reported.

A significant source of N₂O levels in the operating room has been shown in this study. The ophthalmologist, who was closer to the cryoprobe vent than was the anesthetist, was exposed to higher concentrations. The cryoprobe unit can be adapted to scavenging, but available devices to achieve this are cumbersome and difficult to use. A better scavenging device is needed.

**REFERENCES**


Methylnitroacetate Airway Obstruction

**THOMAS H. CROMWELL, M.D.*

Methylnitroacetate has been used for more than 20 years in a variety of procedures, including dental prostheses, cranial bone replacement, and prosthetic hip replacements. More recently, it has been employed in the treatment of pathologic fractures, especially where extensive bone destruction has occurred, making adequate fixation difficult.

Coincident with the extensive use of methylnitroacetate, various complications have been reported, including hypotension resulting from a direct vasodilatory effect of the methylnitroacetate monomer,\(^1,2\) bladder fistula, spinal-cord damage, and arterial occlusion\(^3\) secondary to intense heat produced by the exothermic polymerization process.

To my knowledge, airway obstruction as a complication of methylnitroacetate has not been reported.

**REPORT OF A CASE**

A 41-year-old woman had undergone radical mastectomy for moderately differentiated, infiltrating ductal carcinoma six months prior to admission. She was readmitted with metastases to numerous ribs and the cervical spine. A computerized tomographic scan revealed extensive destruction of the C4 vertebral body, with many lytic lesions in C5 and C6 vertebrae. A cervical myelogram showed no obstruction.

A week after admission the patient underwent anterior surgical exploration of the cervical spine with general anesthesia. A large defect in C3 and C4 vertebrae was filled with methylnitroacetate.

In the immediate postoperative period, the patient complained of slight respiratory distress and a sharp right-sided pain in the neck associated with swallowing. Within two days she was able to tolerate liquids and semisolids, but the pain and dysphagia continued.

On the sixth postoperative day, dysphagia developed, and it progressed over the subsequent ten days to complete inability to pass even liquids.

An esophagram revealed pooling of the contrast medium in the hypopharynx, with a small, constricted esophageal lumen in the criopharyngeal area. Interstitial inflammatory disease involving the left lung was observed on roentgenograms of the chest. A diagnosis of dysphagia secondary to pain and edema in the criopharyngeal area was entertained, and an attempt to relieve the pain and spasm with narcotics was unsuccessful. The patient was then scheduled for esophagoscopy and reexploration of the neck.

Following an inhalational induction, laryngoscopy revealed a 2 × 3-cm submucosal mass in the posterior pharyngeal wall at the level of the epiglottis, extending down to the arytenoids compressing the esophagus and arytenoids anteriorly against the epiglottis. Identification of the airway opening was made with some difficulty, since it was not only compressed, but deviated to the right. A #7