6 to 81 min. The levels of N_2O 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 N_2O 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.[6] 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 N_2O 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.

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Methylmethacrylate Airway Obstruction

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Methylmethacrylate 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 methylmethacrylate, various complications have been reported, including hypotension resulting from a direct vasodilatory effect of the methylmethacrylate monomer,[1,2] bladder fistulas, 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 methylmethacrylate 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 methylmethacrylate.

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 dyspnea 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 cricopharyngeal 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 cricopharyngeal 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

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cuffed endotracheal tube was passed with relative ease once the airway opening was identified.

Subsequent surgical exploration revealed anterior displacement of the entire mass of methylmethacrylate out of the vertebral body to an area posterior to and slightly to the left of the larynx. The mass measured approximately 3 × 4 cm, with an attached spine of 3 × 5 cm. Removal of the mass was accomplished and a cricopharyngeal myotomy was performed. No further attempt at stabilization was made. The posterior pharyngeal mass observed during initial laryngoscopy was no longer present upon re-examination at the termination of the surgical procedure.

The patient was awakened with the endotracheal tube in place. The endotracheal tube was removed in the post-anesthesia recovery room. The patient was then admitted to the intensive care unit for observation. The postoperative course was uneventful. Two days after the operation she was able to swallow liquids and semisolids with ease, and experienced no further dyspnea or dysphagia. Roentgenograms of the chest showed significant clearing.

Discussion

The use of methylmethacrylate for stabilization of pathologic fractures is relatively new, and experience with its use for fractures of the cervical spine is limited. In a series of 12 patients in whom methylmethacrylate was used by orthopedic surgeons at our institution, ten have had uneventful courses, with successful stabilization.† One patient had a cardiac arrest in the post-anesthesia recovery room, but it was unrelated to the methylmethacrylate, and the other patient was the one whose case is reported here.

The circumstances leading to displacement of methylmethacrylate in this patient are unclear, although extensive osseous destruction leaving little substance for the methylmethacrylate to key to is a possibility. The displacement probably occurred soon after the original operation, since the patient experienced symptoms immediately. Radiopaque methylmethacrylate is normally used for these procedures, but the dye was inadvertently omitted in the case described. Had it been used, diagnosis of displacement could have been made sooner. With the increasing use of methylmethacrylate for pathologic fractures of the cervical spine, anesthesiologists should be aware of this unusual complication.

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Hyperthermia and Ketoacidosis during Anesthesia in a Child with Glycogen-storage Disease

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Hyperthermia and severe nondiabetic ketoacidosis were observed during anesthesia in a child with glycogen-storage disease. This case is being reported because the patient's initial clinical and laboratory findings resembled those found in malignant hyperthermia. Second, the unusual occurrence of severe ketoacidosis only during anesthesia in a child with glycogen-storage disease has not been described previously.

Report of a Case

A 6-year-old boy was scheduled for surgical correction of an external-auditory-canal stenosis. As an infant he had failed to grow normally and had been found to have hepatomegaly. Examination by light and electron microscopy of a liver biopsy specimen had showed increased glycogen in the liver, and a diagnosis of glycogen-storage disease had been made. Glycogen-storage disease Types I, II, III, IV, VI, and VII had been excluded by enzymatic studies of the biopsy specimen. Studies for Types VIII, IX, and X had not been performed, because these types had not yet been described at the time the biopsy was done. The child never had hypoglycemia, and acidosis never developed during febrile episodes or other stressful periods. Clinically, he was thought to have Type IX glycogen-storage disease (hepatic phosphorylase kinase deficiency). He had undergone general anesthesia with halothane on three previous occasions. At 5 months of age, he had had a hydrocelectomy and inguinal herniorrhaphy. His temperature had been 37 C at the start of the operation. At 20 months of age, the liver biopsy had been performed. Intubation of the trachea had been facilitated by succinylcholine. Thirty-five min after induction, the temperature had been 37.4 C, and 70 min after induction, 37.8 C. Anesthesia had lasted 90 min, and the temperature had remained 37.5 C for four hours in the recovery room. At 4 years of age, anesthesia had been administered for tomography of the internal auditory canals. Succinylcholine had again been used to facilitate intubation of the

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