Brief Review

Illicit use of modern volatile anaesthetics

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Sixteen reported cases of abuse of modern volatile anaesthetics are summarized. Twelve of the sixteen subjects died. Halothane was ingested or injected intravenously for suicidal purpose, and sniffed for mood elevation.

Abuse of modern volatile anaesthetics deserves more attention than it has received in the past.

Key words

ANAESTHETICS, VOLATILE: halothane, enflurane, abuse. SUICIDE:

Drug abuse among hospital personnel¹⁻⁵ especially anaesthesia personnel⁶⁻⁸ has been identified as a major problem. Ward and Saidman⁸ reported 325 instances of narcotic abuse among anaesthesia personnel, and 30 deaths secondary to drug abuse in 235 confirmed cases.

Alcohol, narcotics, barbiturates, tranquilizers, and nitrous oxide have been implicated in these reports,¹⁻⁸ with less attention to volatile anaesthetics.

Modern volatile anaesthetics have also been abused,⁹⁻¹⁹ most commonly by operating room personnel.^{11-13,15} Several deaths due to halothane^{9,11,12,14-18} and enflurane¹³ abuse have been reported. By reviewing these reported cases, we hope to draw to the anaesthetists' attention the illicit use of modern volatile anaesthetics, before it becomes beyond our control.

Case reports

The reported cases are summarized in the Table. Four typical cases are presented.

1. Ingestion of halothane for suicidal purpose.

A 48-year-old female (patient 1) ingested 250 ml of halothane for suicidal purpose. The patient was comatose when brought to hospital. She vomited food remains which smelled strongly of halothane. Cardiac arrest occurred following aspiration of the vomitus. She was successfully resuscitated and mechanically ventilated. One hour and fifty minutes after admission, the patient regained consciousness and obeyed simple orders, and began to "fight" the ventilator. The endotracheal tube was removed. However, one hour later, the blood pressure had fallen to 70 mmHg, consciousness was lost, and the patient was reintubated. After 36 hours of mechanical ventilation, she gained consciousness. Subsequently, she was weaned from the ventilator and discharged from the hospital in two weeks. At follow up examination, no abnormalities in liver function tests were documented.¹⁰

2. Intravenous injection of halothane for suicidal purpose.

A 42-year-old man (patient 4) was admitted to hospital within an hour of intravenous self-administration of 9 ml of liquid halothane. He was comatose and cyanotic. There were extensive crepitations over both lung fields. The patient was treated with mechanical ventilation, with 5 cm H₂O of PEEP.

Although his level of consciousness improved transiently, he became hypotensive with peripheral vasoconstriction and profound sinus bradycardia, followed by asystole. Autopsy showed grossly oedematous lungs.¹⁸

3. Sniffing of halothane for a "high" sensation.

A 26-year-old male anaesthetist (patient 6) was found dead in the prone position on a mattress at home. He was holding a 25 × 30 cm polyvinyl bag

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TABLE Reported cases of abuse

Patient no.	Age (years)	Sex	Occupation	Agent	Mode of administration	Purpose	Outcome	Blood concentration (mg/100 ml)	Reference no.
1	48	F	?	Halothane	Ingestion	Suicide	Recovered		10
2	28	M	?	Halothane	Ingestion	Suicide	Recovered		10
3	19	M	Hospital employee	Halothane	Ingestion	Suicide	Died	65	14
4	42	M	?	Halothane	Intravenous injection		Died	0.79	18
5	42	M	Surgeon	Halothane	Sniffing	Mood elevation	Died		11
6	26	M	Anaesthetist	Halothane	Sniffing	Mood elevation	Died	20	11
7	24	M	OR technician	Halothane	Sniffing		Died		15
8	28	M	ER technician	Halothane	Sniffing		Died		15
9	22	M	OR technician	Halothane	Sniffing		Died		15
10	21	M	?	Halothane	Sniffing		Died		16, 17
11	20	M	Navy corpsman	Halothane	Sniffing (?)		Died		16, 17
12	19	M	?	Halothane	Open-drop		Died	20	9
13	25	F	OR technician	Halothane	Sniffing	Mood elevation	Died		12
14	25	F	OR technician	Halothane	Sniffing		Recovered		12
15	23	F	OR technician	Halothane	Sniffing		Recovered		12
16	29	F	Student nurse anaesthetist	Enflurane	Topical application	Treatment of Herpes Simplex Labialis	Died		13

with a gauze pad in it at his mouth. He was a known alcoholic and halothane abuser. The halothane concentration in the blood at autopsy was 20 mg/100 ml.¹¹

4. Misuse of enflurane.

A 29-year-old student nurse anaesthetist (patient 16) obtained a full 250 ml bottle of enflurane and for the next three hours was observed with a gauze pad to which she had applied the enflurane. She believed that the topical application of enflurane might cure herpes simplex on her lower lip. About an hour later, she was found in a women's rest room slumped over while sitting on a commode. Her forearms were crossed on her knees and her head rested on her forearms over her lap. The enflurane bottle was empty. Resuscitation was unsuccessful. Autopsy findings were normal except that appreciable amounts of enflurane were found in the skin, gastric contents, blood and lung.¹³

Discussion

Halothane was ingested for suicidal purpose by three patients (1, 2, 3) and injected intravenously by patient 4. Patients 1 and 2 ingested 250 ml of halothane, but recovered, while patient 3 ingested only 35 ml but died. This suggests that even when a patient has ingested 250 ml of halothane, if the timing and treatment are appropriate, survival is possible. Absorption of halothane continues from the gastrointestinal tract, therefore mechanical hyperventilation, hastening pulmonary elimination of halothane must be instituted.¹⁰ Intravenously injected halothane is very toxic, damages pulmonary vessels and leads to acute pulmonary oedema and death.^{18,20,21}

Some subjects sniffed halothane in order to get a "high" sensation.^{11,12} Several died, probably due to airway obstruction or cardiac arrhythmias.^{11,15-17,19} Habitual sniffing of halothane has been reported to induce "hepatitis",¹² and a death due to hepatic failure.¹²

We must pay more attention to the illicit use of volatile anaesthetics, since in addition to these case reports of abuse, numerous unreported cases likely exist. Most of the reported abusers are hospital-related personnel, such as operating-room technicians, emergency-room technicians, student nurse anaesthetists, surgeons, and anaesthetists. The current incidence of abuse of volatile anaesthetics appears low compared to abuse of narcotics or

sedatives;⁶ however, it can be predicted that this incidence of abuse of volatile anaesthetics will increase. Abuse of narcotics and sedatives is now widely known, and strict control of these drugs will force the abusers to seek alternative drugs. They may find halothane or enflurane good alternatives, since at present volatile anaesthetics are not carefully controlled, and practically anyone in an operating room can remove a bottle of halothane or enflurane. Nitrous oxide has been widely abused, especially among dentists, and student dentists,^{4,5} but the volatile anaesthetics, packaged in small bottles, are much easier to carry away than a heavy nitrous oxide cylinder.

The danger of abuse of modern volatile anaesthetics requires careful control of drugs. As Spencer and Raasch^{16,17} state, it is important that every effort be made to prevent future deaths from abuse of modern volatile anaesthetics. First, everyone associated with the clinical use of these agents must be aware of the potential for abuse and the occurrence of sudden death during abuse. Secondly, an educational effort should be made to acquaint medical personnel with the danger of abuse of these agents. Thirdly, access to these drugs should be restricted to anaesthetists for their immediate use.

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Addendum

Since completion of this review, an additional case has been reported. A 35-year old hospital technician ingested halothane and lapsed into coma. He recovered uneventfully following intensive supportive care.

(Wig J, Chakravarty S, Krishnamurthy K, Mehta D. Coma following ingestion of halothane. Its successful management. *Anaesthesia* 1983; 38: 552-5.)

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Résumé

On rapporte 16 cas d'abus d'agents anesthésiques volatils modernes. Douze des 16 patients sont décédés. L'halothane a été ingéré ou auto-injecté par voie intraveineuse dans un but suicidaire ou inhalé pour provoquer une sensation de bien-être. On pense que l'abus des agents d'inhalation modernes mérite plus d'attention qu'il ne lui en a été accordé dans le passé.