

## A murder disguised as a medical accident: A case report of homicidal poisoning of three anesthetics

Youjia Yu<sup>1</sup>, Daoyin Gong<sup>2</sup>, Yong Cao<sup>1</sup>, Meigui Lu<sup>1</sup>, Feijun Huang<sup>1,\*</sup>, Zhenhua Deng<sup>1</sup>

**Abstract:** Homicide by intravenous injection of multiple anesthetics was rare. We report a 41-year-old man died after transfusion of levofloxacin, gentamicin and clindamycin in the hospital. The results of toxicological investigation demonstrated three anesthetic agents (propofol, midazolam, vecuronium) in the deceased's blood, urine, liver and kidney. The autopsy and histological findings were in accordance with previous reports of propofol-related death. Eosinophilic granulocyte infiltration was not observed, but the IgE level was significantly high. After a thorough investigation, the death was clarified as a murder disguised as medical accident, from which the offender purposed to claim the compensation from the hospital. We concluded that the cause of death was cardiac and respiratory failure induced by respiratory muscles relaxation, secondary to the intravenous administration of a lethal cocktail of anesthetics, but not the anaphylaxis of antibiotics. To our knowledge, it was the first reported case of disguised medical accident complicated by anesthetics. This case highlighted the significance of cooperation between pathologists and toxicologists.

**Key Words:** forensic science, poisoning, toxicology, propofol, anesthetics.

Propofol (2,6-diisopropylphenol), a intravenously administered hypnotic/amnestic agent with rapid onset of action, has been used for inducing and maintaining general anesthesia since 1986 [1]. The mechanisms of propofol are mainly by positively modulating the inhibitory function of the neurotransmitter g-aminobutyric acid (GABA) through GABAA receptors [2]. It is one of the commonest agents of abuse among health care professionals [3]. Midazolam, developed in the 1970s, is also a short-acting drug used in anesthesia. It is the most commonly used benzodiazepine as a premedication for sedation. It is seldom life threatening but its toxicity increases when combined with other CNS depressants. Vecuronium is a

muscle relaxant for facilitating endotracheal intubation and providing skeletal muscle relaxation during surgery or mechanical ventilation.

Publicans concerning death after anesthetics abuse, accidental overdose, homicide or suicide have been reported [1, 3-11]. However, homicide by intravenous injection of multiple anaesthetic agents was infrequent, and it was even rarer that the offender, in purpose of 'getting compensation for medical accident', disguised his crime as a medical accident. In the following, we report a male patient with diarrhea died after transfusion in the hospital which was considered to be a medical accident. After thorough investigation and systematic toxicological analysis, the case was confirmed as a murder.

---

1) Department of Forensic Pathology, West China School of Basic Science and Forensic Medicine, Sichuan University, Chengdu, Sichuan, PR China

2) Institute of Basic Medicine, Chengdu University of Traditional Chinese Medicine, Wenjiang District, Chengdu, Sichuan, PR China

\* Corresponding author: Tel. +86-130-9632-6175 , Email: hfj60123@hotmail.com

## CASE REPORT

A 41-year-old man with diarrhea was found dead within 5 minutes after transfusion of levofloxacin, gentamicin and clindamycin in the hospital. Cyanosis and dyspnea occurred soon after withdrawal of the needle, then respiratory and cardiac arrested afterward. The death caused medical dispute between the dependents and the doctor. Therefore autopsy and toxicological investigation were requested, by which propofol and other anesthetic agents were detected from biological samples. After further investigation by local police, the death was clarified as a homicide committed by a person with anesthetic knowledge.

The suspected offender used to study in the anesthesiology department. According to the confession, in hatred of the victim, he planned the murder and incidentally, claimed compensation. He stole mannitol (250ml), two ampoules of propofol (200mg/20ml per ampoule), one ampoule of midazolam (10mg per ampoule) and two ampoules of vecuronium (4mg per ampoule) from the hospital, then lied the victim into drinking large quantity of mannitol aqueous solution so that the victim suffered from diarrhea. He brought the patient to the hospital. As the patient fell into sleep during transfusion, he quickly infused pre-prepared midazolam (10mg) via the apparatus infusionis to induce deep sleep. Then he mixed propofol with vecuronium and infused the anesthetics mixture. After the death occurred, he pretended to be the victim's brother with a forged ID card and claimed that the death was due to clindamycin allergy, therefore demanded compensation. But the doctor suspected the truth of his identity and reported to local police. Finally, out of fear and contrition, he confessed his criminal facts.

### Autopsy findings

The autopsy was performed within 6 days after death. The deceased weighed 60kg. External examination revealed a needle mark with slight subcutaneous hemorrhage from transfusion in the skin of the back of left hand. His palpebral conjunctiva was pale and hyponychium was cyanosis. No other sign of injury had been found.

Autopsy showed multifocal emphysema within the surface of both lungs. Laryngeal edema was not observed. Histological findings, using routine HE (hematoxylin-eosin) staining, were not specific and mainly in lungs, including pulmonary edema, compensatory emphysema, lymphocytes and monocytes infiltration in bronchial walls, focal thickening and fibrosis of alveolar septum and congested capillaries in the alveolar walls, but eosinophilic granulocyte infiltration was not involved. Additionally, congestion of all organs was noticed as well.

During the autopsy, samples of central blood

(from the cardiac cavity), gastric content, urine (from the bladder), kidney and liver were set aside for toxicological investigations.

### Immunoassay findings

The IgE test on heart blood of the victim was conducted in clinical laboratory of West China Hospital, Sichuan University. The postmortem total serum IgE was 1367.61 IU/mL.

### Toxicological findings

Systematic toxicological investigations on biological samples and residue from the infusion bags were conducted in the Toxicological Laboratory of the Department of Forensic Medicine, Sichuan University. Gas chromatography/mass spectroscopy (GC/MS, 7890A-5975C, Agilent) and high-performance liquid chromatography (HPLC DAAD) were used to investigate for illegal and prescribed drugs, alcohol, and other poisons.

The results of the toxicological findings are given in Table 1. Clindamycin, levofloxacin and gentamicin were detected in heart blood and infusion bags. Further analysis was negative for metallic poisons, alcohol and gas poisons.

**Table 1.** The results of the toxicological findings: postmortem concentrations of propofol, midazolam, and vecuronium detected from the heart blood, liver, kidney and urine. (ND=not detected)

	Propofol µg/mL	Midazolam µg/mL	Vecuronium µg/mL
Heart blood	0.517	0.098	0.10
liver	3.983	0.31	0.25
kidney	0.765	0.61	0.39
urine	ND	0.012	0.12

## DISCUSSION

In forensic medicine practice, fatalities caused by anesthetics were rare compared with other poisoning deaths. Such deaths were usually limited to medical participators with expertise, as they have easier access to these agents and higher incidence of abuse. Self-administration of intravenous anesthetic/narcotic agents is the most common manner in suicide and abuse cases, [1, 3-9] while ingestion, inhalation have been reported in accident and homicide cases [10, 11]. Homicide by intravenous injection of anesthetics was rare. The only propofol-related homicide case was reported by Kirby [1]. A 24-year-old woman, who asked an acquaintance to release her headache, was injected with lethal dose of propofol. The lot numbers on the vials helped the police investigators to find the suspect, a male ICU (intensive care unit) nurse [12]. Similarly, the offender in our case was a person with anesthetic knowledge and access

**Table 2.** Comparison of reported postmortem propofol concentrations in blood and liver

Cases	Age	Sex	Postmortem concentration		Other drugs detected	Cause of death
			Blood ( $\mu\text{g/ml}$ )	Liver ( $\text{mg/kg}$ )		
Drummer [13]	29	F	0.22	1.4	Oxazepam	suicide
Chao [4]	37	M	2.5	22	-	suicide
Iwersen-Bergmann [5]	26	M	5.3	27	-	Accident(abuse)
Kranioti [3]	38	F	2.40	0.560	lidocaine	Accident(abuse)
Klausz [9]	42	F	1.31	-	Alcohol	Accident(abuse)
Roussin [6]	27	M	0.026	-	-	Accident(abuse)
Cirimele [7]	44	F	0.039	-	midazolam	Accident(abuse)
Strehier [8]	21	M	0.071	-	-	Accident(abuse)
Kirby [1]	24	F	4.3	-	-	homicide
Ours	41	M	0.517	3.983	Midazolam Vecuronium	homicide

to anesthetics. From the view of criminology, both the criminal scene and opportunity the offender had chosen were with high risk of exposure. However, driven by profit, he planned the crime so well that without the abnormal anesthetic agents detected in toxicological investigation, both the police and the pathologists would be deceived.

Unlike the cases of self-administration, the ampoules and syringes in our case could not be found. The loss of ampoules and syringes, on one hand, was a hint of intentionally destroyed scene for police investigators. On the other hand, we could only learn of the doses of anesthetics from the offender's confession, which might be incorrect or inaccurate. Besides, it was unusual that such a deliberate murder was in purpose of claiming compensation from medical accident. To our knowledge, it was the first reported case of disguised medical accident complicated by anesthetics.

Standard doses of propofol in un-premeditated patients are 2 to 2.5 mg/kg body weight. The induction of general anesthesia occurs in 1–2 min after injection and patient arouses after 5–10 min [3]. In a person of weight 60 kg, a dose of 120 to 150 mg is required for induction. Generally, the speed of administration is 40 mg per 10 sec. At the scene of death, 400 mg of propofol, approximately three times the recommended dose for induction of anesthesia, was infused rapidly. Besides, the offender injected 10 mg of midazolam, which was in accordance with the recommended dose for induction of anesthesia (5–10 mg). The dose of vecuronium in our case was about 0.13 mg/kg, slightly higher than the intubating dose. Even so, we should be cautious that all the anesthetic agents were administrated in short period of time without respiratory assistance and medical control. Due to the short duration of action of these anesthetics, we could infer that the respiratory muscles relaxation occurred within few minutes and caused death.

We compared our results on postmortem propofol concentrations with other fatal cases reported in the literature (Table 2). All the concentrations listed were not above therapeutic levels and within a wide

range of variation. Therefore, we should not deny the fact of propofol poisoning when the results of toxicological investigations display low level of propofol.

According to the immunoassay, the IgE level (1367.61 IU/mL) was significantly higher than reference value (1.5–144 IU/mL)[14] which revealed allergic reaction. However, the raise of IgE level has been reported in cases of clindamycin, propofol and vecuronium allergy [15–17]. In our case, it was the first propofol exposure for the victim and his allergic history of antibiotics was not clear, thus the probability of propofol allergy existed.

The autopsy and histology findings were mainly in lungs, together with congestion of all organs, which corresponded with previous reports of propofol-related death [9]. But no significant manifestation which supported the diagnosis of anaphylactic shock, such as oropharyngeal angioedema and bronchospasm, [15] eosinophilic granulocyte infiltration, had been observed. Therefore, considering the large dose and short time of administration, we could conclude that the actions of the anesthetics occurred prior to anaphylaxis, and directly resulted in death.

As a conclusion, the cause of death was cardiac and respiratory failure induced by respiratory muscles relaxation, secondary to the intravenous administration of a lethal cocktail of anesthetics (propofol, midazolam, vecuronium). The transfusion of three antibiotics (levofloxacin, gentamicin, clindamycin) did not contribute to death.

This case highlighted the significance of cooperation between pathologists and toxicologists. During forensic medical practice, under the condition of significantly high IgE level but no typical pathological manifestation of anaphylaxis, it was recommendatory for pathologists to review the autopsy and histology findings and consult with toxicologists about the details of a case.

**Conflict of interest.** The authors declare that they have no conflict of interest.

**Acknowledgement.** None declared.

**References**

1. Kirby, R.R., J.M. Colaw, and M.M. Douglas, Death from propofol: accident, suicide, or murder? *Anesth Analg*, 2009. 108(4): p. 1182-1184.
2. Trapani, G., *et al.*, Propofol in anesthesia. Mechanism of action, structure-activity relationships, and drug delivery. *Curr Med Chem*, 2000. 7(2): p. 249-271.
3. Kranioti, E.F., *et al.*, Lethal self administration of propofol (Diprivan). A case report and review of the literature. *Forensic Sci Int*, 2007. 167(1): p. 56-58.
4. Chao, T.C., *et al.*, The first fatal 2,6-di-isopropylphenol (propofol) poisoning in Singapore: a case report. *Forensic Sci Int*, 1994. 66(1): p. 1-7.
5. Iwersen-Bergmann, S., *et al.*, Death after excessive propofol abuse. *Int J Legal Med*, 2001. 114(4-5): p. 248-251.
6. Roussin, A., *et al.*, Death related to a recreational abuse of propofol at therapeutic dose range. *Br J Anaesth*, 2006. 97(2): p. 268.
7. Cirimele, V., *et al.*, Determination of chronic abuse of the anaesthetic agents midazolam and propofol as demonstrated by hair analysis. *Int J Legal Med*, 2002. 116(1): p. 54-57.
8. Strehler, M., *et al.*, [Lethal mixed intoxication with propofol in a medical layman]. *Arch Kriminol*, 2006. 217(5-6): p. 153-160.
9. Klausz, G., *et al.*, Evaluation of a fatal propofol intoxication due to self administration. *J Forensic Leg Med*, 2009. 16(5): p. 287-289.
10. Risse, M., *et al.*, Multiple homicides as a result of chloroform poisoning: case report and experimental study. *Forensic Sci Int*, 2001. 124(2-3): p. 209-213.
11. Madea, B. and F. Musshoff, Homicidal poisoning with halothane. *Int J Legal Med*, 1999. 113(1): p. 47-49.
12. Levy, R.J., Clinical effects and lethal and forensic aspects of propofol. *J Forensic Sci*, 2011. 56 Suppl 1: p. S142-147.
13. Drummer, O. H., A Fatality Due to Propofol Poisoning. *J Forensic Sci*, 1992, p. 1186-1189.
14. Carosso, A., *et al.*, Reference values of total serum IgE and their significance in the diagnosis of allergy in young European adults. *Int Arch Allergy Immunol*, 2007. 142(3): p. 230-238.
15. You, B.C., *et al.*, A case of propofol-induced oropharyngeal angioedema and bronchospasm. *Allergy Asthma Immunol Res*, 2012. 4(1): p. 46-48.
16. Sudheer, P.S. and I.R. Appadurai, Anaphylaxis to vecuronium: the use of basophil CD63 expression as a possible screening tool to identify a safe alternative. *J Clin Anesth*, 2007. 19(7): p. 555-557.
17. Chiou, C.S., *et al.*, Clindamycin-induced anaphylactic shock during general anesthesia. *J Chin Med Assoc*, 2006. 69(11): p. 549-551.