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CASE SERIES

Complications of low dose propofol in electroconvulsive therapy: a case series

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ABSTRACT

We report a cases series (of four cases) of serious complications observed after propofol injection for electroconvulsive therapy. The signs and symptoms included hyperthermia, hypotension, lethargy, pancytopenia or leukocytosis, as well as renal and hepatic laboratory parameters disturbances. In all of these cases, signs and symptoms improved rapidly. Although propofol used in these patients was drawn from a multi-dose vial, which can be a source of contamination and infection, rapid disappearance of the signs and symptoms in 3 of the patients after three hours, and remission of hypotension and lethargy the fourth patient within 10 hours, precludes the possibility of sepsis. Anesthesiologists must remain vigilant during propofol use and must shun the use of multi-dose vials.

Key words: Propofol infusion syndrome**;** Multiple organ failure**;** Rhabdomyolysis

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INTRODUCTION

Propofol, an intravenous sedative-hypnotic agent for use in the induction and maintenance of anesthesia or sedation, can be associated with grave complications such as multiple organ failure. Propofol has largely replaced thiopentone for use in electroconvulsive therapy (ECT), although, the later drug is still widely used for this purpose along with midazolam, etomidate etc. Succinylcholine is an ultra short acting muscle relaxant and preferred by many of the anesthesiologists in the world. It is used for brief relaxation in ECT patients. We describe a case series of particularly mild multiple organ failure in four of our patients in a single day, and describe the probable causes and the preventive measures. All of the patients were successfully managed without any long term sequelae.

CASE REPORT

On a typical working day 16 patients aged 20-52 years, were admitted in electroconvulsive therapy (ECT) ward of Roozbeh Psychiatry Hospital, Tehran, (Iran). All patients had normal hemodynamic parameters, no fever, no evidence of any infection, and no abnormal laboratory tests.

The patients underwent ECT treatment with bilateral electrode placement and a stimulus dose of 40%–85% (approximately 216–430 mC) with the Thymatron DGx device (Somatics, LLC, Lake Bluff, IL).

Each patient has had general and systemic physical examination and routine monitoring started, including electrocardiography (ECG), non-invasive blood pressure (BP), heart rate (HR) and pulse oximetry (SpO_2). Preoxygenation was done with face

Table 1: Laboratory test before and after ECT

Parameter	Patient # 1		Patient # 2		Patient # 3		Patient # 4	
	Before	After	Before	After	Before	After	Before	After
Age (y)	20		34		32		42	
WBC count (/μL)	6400	1200	6500	4400	7100	27000	5820	16600
Hb (Gm/dL)	12	8.5	13	12	14	13	13	11
Platelets (/μL)	270000	115000	220000	129000	260000	240000	239000	210000
Urea (mg/dL)	26	31	32	40	31	50	27	31
Creatinine (mg/dL)	0.8	1.0	0.8	0.8	1.0	1.0	1.0	1.6
SGOT (u/L)	19	26	19	69	15	38	23	30
SGPT (u/L)	11	21	12	15	22	70	17	21
ESR (cm)		10		15				10
CRP		+		+		+++		++

mask, anesthesia was induced using propofol (80-100 mg) and atropine (0.5 mg) IV. Inj succinylcholine (30-40 mg) was given as a paralytic agents. Ventilation was carried out by 100% oxygen. For two patients (male) with impression of awareness signs, a bolus of 50 mg propofol was repeated before electrical stimulus delivery. All the patients completed the procedure uneventfully, and were transferred from the recovery room in normal time without any notable problem.

About 2 to 3 hours later, a disturbance in their vital signs was reported by the ward staff. Four patients (two male and two female) were reported to suffer from fever (38-38.5° C), hypotension and lethargy. A physical examination excluded the signs and symptoms of malignant hyperthermia and malignant neuroleptic syndrome, including muscular rigidity, hyperthermia, severe tachycardia. Supportive treatment was started with administration of one liter crystalloid solution, and acetaminophen suppository. The signs and symptoms disappeared in 3 of the patients after three hours, but hypotension and lethargy persisted in one patient for 10 hours, after which he became normal.

Demographic data and laboratory investigation results are tabulated in Table 1. Patient #1 and #2 were females, patient #3 and #4 were males.

In patient #1 a severe pancytopenia was seen (Hb = 8.5 gm/dL; WBC = 1200/μL). In this patient, hypotension persisted for 12 hours.

In patient #3 and #4 a leukocytosis was noted. These patients had received an additional dose (50 mg) of propofol.

In all patients other than #1, fever and hypotension improved within 2 hours.

Creatine phosphokinase (CPK) and troponin were measured in patient #3 and very high level was noticed: CPK +951 (normal; 195) Troponin = 0.5; CPK-MB = 29 (normal < 24).

Propofol used was from Tehran Shimi Company in 20 ml vials, each vial was used for two patients in separate disposable syringes. Succinylcholine was from Caspian Tamin Pharmaceutical Company, and it was stored 4 hours between 15 to 25 °C, due to a disturbance in refrigerator. Each vial containing 500 mg succinylcholine, was diluted and prepared for injection in separate disposable syringes.

DISCUSSION

Although propofol has attractive properties as a first line drug for sedation, but some complications such hypertriglyceridemia and other adverse effects have been observed in some patients. The clinical side effects of propofol are generally dose dependent ([1]). Propofol infusion syndrome (PRIS) is reported as a rare but fatal complication in critically ill children given prolonged high-dose infusions of the drug ([2]). PRIS typically presents as severe rhabdomyolysis, acute kidney injury, hyperkalemia, metabolic acidosis, and hepatomegaly ([3]). Myocardial injury may occur in severe forms, presenting with various ECG changes, severe arrhythmias, and cardiovascular collapse ([4]).

Common organ systems affected by PRIS include the cardiovascular system, liver, the skeletal muscles, the kidneys, and the metabolic system. Skeletal muscular manifestations include myopathy and rhabdomyolysis. Skeletal muscle injury may be complicated by hyperkalemia and acute kidney injury. Cardiac failure and metabolic acidosis usually occur early and are dose-dependent, while arrhythmia, and other electrocardiographic changes and muscle injury appear more frequently after prolonged propofol infusions, irrespective of dose. Interestingly, it has been shown that elder patients can develop PRIS at comparatively lower doses of propofol, in whom arrhythmia, hypertriglyceridaemia and fever are less frequently seen, with more chances of survival.[5] Some authors reported that neurologic injuries and fever may act as a priming factor for propofol to trigger ([6]).

In our case series the signs and symptoms of PRIS

occurred with a very small dose of propofol as compared to other case reports published in the literature.

In May 2004, in a private hospital in Tehran, an anesthesiologist used propofol that had been stored in sterile syringes for 15 days; soon after the injection (at the time of operation) multiple organ failure occurred in 11 patients, out of which two patients died. Toxification of propofol in the presence of air causing impaired fatty acid oxidation was mentioned as the explanation of this catastrophic accident.

All of these features in our case series may be explained by possible sepsis due to contamination of the drug (propofol vial), but in our patients the fever and other signs disappeared very soon and without the need of any specific therapy for sepsis. Multi-dose vials are notorious in spreading cross-infections in the hospitals. Elevation of CK may have been associated with ECT-induced muscle injury. All parameters returned to normal levels within few days.

Although propofol from Tehran Sheme Company is still being used in other hospitals of Tehran; in our hospital, propofol from the cited company was banned.

CONCLUSION

Use of propofol necessities a good vigilance and caution, regardless of the age and gender of the patients, or the dose and the duration of the infusion. We recommend that propofol and succinylcholine marketing in multi-dose vials should be banned as a potential safety risk.

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Authors' contribution:

JR: Concept

AS: conduction of the study work

MK: manuscript editing

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