

Propofol: An Update of its Use in Emergency Medicine

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Abbreviations

GABA: gamma-amino butyric acid; ED: emergency department; PS: procedural sedation; PRIS: propofol infusion syndrome; AS: antimuscarinic syndrome; SLP: seizure-like phenomena; ECT: Electroconvulsive therapy.

Propofol, (an emulsion formulation of 2, 6 diisopropylphenol), is a short acting intravenous hypnotic drug and was produced in 1975 [1]. Also, Propofol, was developed in emergency department (ED) in 1996 for procedural sedation [2]. Its pharmacological mechanism goes back to its agonistic characteristics on gamma-amino butyric acid (GABA) receptors. It also has some antiemetic and euphoric effects. Moreover, it inhibits afferent sympathetic activity and reduces reflex sensitivity of cardiac baroreceptor reflex. Propofol can cause vasodilatation by stimulating the production of nitric oxide (NO) [3, 4]. It's relatively few serious side effects such as: hypotension, subsequent asystole, bradycardia and dose-dependent respiratory depression, have turned propofol to be a drug of choice in many medical procedures in which general anesthesia is not needed. Propofol is contraindicated those patients that suffer from any kind of known or suspected allergy to propofol, eggs, or soy products [3,5]. In existing ED reports, propofol injection pain is uncommon (2% to 20%). An investigation described technique that prevents such discomfort in 60% of the time. And that is the administration of 0.5 mg/kg intravenous lidocaine with a rubber tourniquet in place 30 to 120 seconds before injection of propofol [5]. Of the advantages of propofol one can say it's easy and rapid titration to a precise endpoint, amnesia, and its rapid recovery which makes it an ideal agent for procedural sedation (PS). It is in a kind of a short-acting alkyl phenol used to induce and maintain anesthesia as well as for PS. This feature has made the propofol to be implemented extensively in EDs for more than a decade. And in the following we will figure out applications and main side effects of propofol in the ED [6].

Applications

A Treatment for joint dislocation

In reduction of dislocations propofol is usually used with initial bolus of 0.5 mg/kg and in case of any further need, excessive dose of 0.25 mg/kg or more can be administered [7].

Alone intubation

Obtained findings have shown that it is the only intravenous hypnotic drug which can be used away from neuromuscular blockade to intubate patients [8].

A treatment for migraine headaches

In an investigation by Soleimanpour it was cleared that, in comparison with intravenous dexamethasone, propofol is an effective drug when faced with migraine headaches cases that referred to ED [3]. Moreover in another investigation by the same author, propofol was successfully used to treat the migraine headaches that are resistant to common treatments [4]. For this, the proposed procedure should be the every 5 to 10 minutes with bolus dose of 10 mg (maximum dose of 80 mg) slowly (at the rate of 1 mL over 10 seconds), until pain was maximally relieved (VAS ≤ 2). In most of studies, the main reason for propofol's remarkable impact on migraine headaches is reported high tendency of propofol to GABA receptors that are in low functional status when someone gets migraine. When injecting propofol, it overcomes them through its GABA agonistic characteristics. Researchers have asserted that using other drugs with this property (excitatory GABA receptors) as potentials to treat migraine headaches, need further investigation [3, 4].

Procedural sedation

For PSs in emergencies, Propofol can be administered intravenously with initial bolus of 0.5 mg/kg (up to a maximum of 50 mg), followed by further boluses, if required [9].

Anticonvulsive effects of propofol

As a GABA agonist propofol (0.75–2.0 mg/kg) suppresses seizure activity through GABA-mediated inhibition of neuronal firing. Other mechanisms can be the inhibition of the N-Methyl-D-aspartate (NMDA) receptor and modulating influx in calcium levels by means of slow calcium ion channels [1].

Asthmatic patients

Not only a safe drug for asthmatic patients, but also propofol may be the drug of choice to induce anesthesia in patients with covert asthma. By decrease in respiratory resistance it may prevent bronchospasm that can be resulted from airway instrumentation [10].

Electroconvulsive therapy (ECT)

Methohital, etomidate and propofol are the most widely studied hypnotic agents for use in ECT. Hence, in some countries, propofol is the only hypnotic agent available to the anesthesiologist for ECT. However, if used in traditional anesthesia induction doses of 2 mg/kg, it would be major disadvantage in that it is antiepileptic and reduces seizure length [5].

Main Side Effects

Propofol infusion syndrome

Being an uncommon, Propofol infusion syndrome (PRIS) is a potentially fatal side effect of propofol. No comprehensive and accepted defined side effects has yet be mentioned about propofol, but in most cases, different integrations of the followings are described: rhabdomyolysis, hyperkalaemia, hepatomegaly, unexplained metabolic acidosis, kidney failure, hyperlipidaemia, arrhythmia, Brugada-type ECG (elevated ST-segment and coved T-wave) and rapid and progressive heart failure. Suggested mechanism of PRIS is that it inhibits fatty acid oxidation. In the context of PRIS, Hypertriglyceridaemia may be an epiphenomenon resulted from fat overload. Almost the mortalities reported had propofol levels above than 4 mg/kg/hour, and many of PRIS patients were given propofol in a period longer than 48 hours, while PRIS has been reported after only a few hours. The American College of Critical Care Medicine prescribes triglyceride levels check after 2 days, and European regulations offer monitoring metabolic acidosis, rhabdomyolysis, hyperkalemia, and cardiac failure [11].

Antimuscarinic Syndrome (AS)

Accompanied by substances known to have antimuscarinic, the administration of propofol probably affects increase in the AS development risk [12].

Propofol withdrawal seizures

Propofol is concomitant with abnormal seizure-like motor events; however, the exact nature of these events remains ambiguous. During induction, maintenance or emergence, propofol can induce clinical seizures and seizure-like phenomena (SLP); it may even be postponed after anesthesia and sedation in epileptic and non-epileptic patients. Having to say, SLP may happen in patients with or without epilepsy receiving propofol [5].

Competing Interests

The author declares that he has no competing interests.

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