Propofol

Propofol is a potent intravenous (IV) anesthetic agent used for the induction and maintenance of general anesthesia during surgical procedures and medical interventions. It is one of the most widely used and recognized anesthesia drugs in clinical practice. Here are some key points about propofol:

Induction of Anesthesia: Propofol is often used to rapidly induce anesthesia in patients before surgery or medical procedures. It causes rapid loss of consciousness and a state of general anesthesia.

Maintenance of Anesthesia: In addition to induction, propofol can also be used to maintain anesthesia during surgery. Anesthesia providers can adjust the infusion rate to maintain the desired level of anesthesia.

Rapid Onset and Offset: One of the advantages of propofol is its rapid onset of action, typically within seconds after IV administration. It also has a relatively short duration of action, which allows for a quicker recovery when compared to some other anesthetic agents.

Sedation and Amnesia: Propofol induces a state of sedation, amnesia, and unconsciousness. Patients under the influence of propofol do not feel pain or remember the surgical procedure.

Controlled Infusion: Propofol is administered as a controlled infusion through an IV line. The infusion rate is adjusted to maintain the desired level of anesthesia throughout the procedure.

Side Effects: Common side effects of propofol include respiratory depression, hypotension (low blood pressure), and pain at the injection site. These effects are closely monitored during surgery.

Antiemetic Properties: Propofol has antiemetic (anti-nausea and anti-vomiting) properties, making it useful in preventing postoperative nausea and vomiting.

Propofol-Related Infusion Syndrome (PRIS): In rare cases, prolonged and high-dose use of propofol can lead to a condition called PRIS, which may result in metabolic acidosis, heart and kidney dysfunction, and other serious complications. This is why propofol use is carefully monitored, and its dosage is controlled.

Not an Analgesic: It's important to note that propofol is not an analgesic (pain reliever). It is typically used in conjunction with analgesic medications such as opioids to manage pain during and after surgery.

Intravenous Administration Only: Propofol is administered exclusively through IV injection. It is not available in oral or other forms.

Rapid Recovery: Due to its short duration of action, patients typically wake up quickly and experience a clear-headed recovery after discontinuation of propofol.

Color and Lipid Emulsion: Propofol is known for its milky white appearance, and it is formulated as a lipid emulsion. This unique formulation contributes to its rapid onset and offset of action.

Special Considerations: Dosage and administration of propofol are tailored to the patient's age, weight, medical condition, and the type of surgery being performed.

see Agents generally used for induction.

Propofol in neurosurgery

- Impact of Anesthesia on Brain Functional Networks in Moyamoya Disease and Spinal Lesions
- Ultrasound image-based paravertebral nerve block combined with general anesthesia in laparoscopic radical resection of esophageal cancer : Paravertebral nerve block versus general anesthesia in the treatment of esophageal cancer: a randomized controlled trial
- The changes in neural complexity and connectivity in thalamocortical and cortico-cortical systems after propofol-induced unconsciousness in different temporal scales
- Effects of general anesthesia combined with ultrasound-guided lumbosacral plexus block on hemodynamics and postoperative rehabilitation in geriatric patients with total hip arthroplasty
- Increased global and regional connectivity in propofol-induced unconsciousness: human intracranial electroencephalography study
- Verbal Memory Localized in Non-language-dominant Hemisphere: Atypical Lateralization Revealed by Material-specific Memory Evaluation Using Super-selective Wada Test
- Ultrasound guided proximal adductor canal and pes anserinus blocks improve early recovery after arthroscopic ACL reconstruction
- High-Frequency Analysis of the Cerebral Physiological Impact of Ketamine in Acute Traumatic Neural Injury

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Reduces cerebral metabolism, CBF and ICP. Has been described for cerebral protection and for sedation. Short half-life permits rapid awakening which may be useful for awake craniotomy. Not analgesic.

The exact mechanism of action unknown. Short half-life with no active metabolites. May be used for induction and as a continuous infusion during total intravenous anesthesia (TIVA). It causes a dose-dependent decrease in mean arterial blood pressure (MAP) and ICP.

It is more rapidly cleared than and has largely replaced thiopental.

Dexmedetomidine (Precedex®). Alpha 2 adrenergic receptor agonist, used for control of hypertension postoperatively, as well as for its sedating qualities during awake craniotomy either alone or in conjunction with propofol.

Propofol has a mild effect on evoked potential (EP): total anesthesia with propofol causes less EP depression than inhalational agents at the same depth of anesthesia [1)].

Propofol (INN, marketed as Diprivan by Fresenius Kabi) is a short-acting, intravenously administered hypnotic/amnestic agent. Its uses include the induction and maintenance of general anesthesia, sedation for mechanically ventilated adults, and procedural sedation. Propofol is also commonly used in veterinary medicine. It is approved for use in more than 50 countries, and generic versions are available.

Chemically, propofol is not related to barbiturates and has largely replaced sodium thiopental (Pentothal) for induction of anesthesia because recovery from propofol is more rapid and “clear” when compared with thiopental. Propofol is not considered an analgesic, so opioids such as fentanyl may be combined with propofol to alleviate pain.

Propofol has been referred to as milk of amnesia (a play on words of milk of magnesia), because of the milk-like appearance of its intravenous preparation.

It is on the World Health Organization's List of Essential Medicines, the most important medications needed in a health system.

Level II: propofol may control ICP after several hours of dosing, but it does not improve mortality or 6-month outcomes. ✖ Caution: high-dose propofol (total dose > 100 mg/kg for > 48 hrs) can cause significant morbidity (see propofol infusion syndrome).

℞: 0.5 mg/kg test dose, then 20–75 mcg/kg/min infusion. Increase by 5–10 mcg/kg/min q 5–10 minutes PRN ICP control (do not exceed 83 mcg/kg/min = 5 mg/kg/hr).

Side effects include propofol infusion syndrome. Use with caution at doses > 5 mg/kg/hr or at any dose for > 48 hrs.

Propofol, an established hypnotic anesthetic agent, has been shown to ameliorate neuronal injury when given after injury in a number of experimental brain studies. We tested the hypothesis that propofol pretreatment confers neuroprotection against SBI and will reduce cerebral edema formation and neurobehavioral deficits in our rat population. Sprague-Dawley rats were treated with low- and high-dose propofol 30 min before SBI. At 24 h post-injury, brain water content and neurobehavioral assessment was conducted based on previously established models. In vehicle-treated rats, SBI resulted in significant cerebral edema and higher neurological deficit scores compared with sham-operated rats. Low- or high-dose propofol therapy neither reduced cerebral edema nor improved neurologic function. The results suggest that propofol pretreatment fails to provide neuroprotection in SBI rats. However, it is possible that an SBI model with less magnitude of injury or that propofol re-dosing, given the short-acting pharmacokinetic property of propofol, may be needed to provide definitive conclusions [2].

Propofol concentration needed for induction of unconsciousness in 50% of patients is reduced in Parkinson's Disease patients [3].

Complications

Propofol infusion syndrome.

Case series

Malekmohammadi et al. from the Department of Neurosurgery, University of California, Los Angeles, collected local field potentials (LFPs) in 12 awake and anesthetized PD patients undergoing DBS implantation. Spectral power of β (13-35 Hz) and high-frequency oscillations (HFOs: 200-300 Hz) was compared across the pallidum.

Propofol suppressed GPi power by > 20 Hz while increasing power at lower frequencies. A similar power shift was observed in GPe; however, power in the high β range (20-35 Hz) increased with propofol. Before anesthesia both β and HFO activity were significantly greater at the GPi ($\chi2 = 20.63$ and $\chi2 = 48.81$, $p < 0.0001$). However, during anesthesia, we found no significant difference across the pallidum ($\chi2 = 0.47$, $p = 0.79$, and $\chi2 = 4.11$, $p = 0.12$).

GPi and GPe are distinguishable using LFP spectral profiles in the awake condition. Propofol obliterates this spectral differentiation. Therefore, LFP spectra cannot be relied upon in the propofol-anesthetized state for functional mapping during DBS implantation [4].

We analyzed 231 neurosurgery patients. In all patients, propofol was used for standard anesthesia induction. Patient demographics, medical histories, fasting duration, percentage weight loss, baseline blood pressure, and PPV during normal tidal volume breathing and that during forced inspiratory breathing (PPVfi) were recorded. Hemodynamic changes within 10 minutes of intubation were observed. Patients developing hypotension and severe hypotension were determined; lowest mean arterial pressure (MAP) and systolic arterial pressure (SAP) values were recorded, and their differences relative to baseline values were calculated. RESULTS: The incidence of hypotension was 18.6%. Both percentage weight loss and PPVfi were correlated with the changes in MAP and SAP. A PPVfi>14 identified all observed hypotensive episodes with 86% sensitivity and 86.2% specificity, whereas percentage weight loss >1.75% identified all observed hypotensive episodes with 81.4% sensitivity and 70.7% specificity. Furthermore, PPVfi>16.5 identified severe hypotension with 85% sensitivity and 90.5% specificity, whereas percentage weight loss >1.95% identified severe hypotension with 85% sensitivity and 73% specificity. CONCLUSIONS: Percentage weight loss and PPVfi are good predictors of hypotension after anesthesia induction and, thus, may allow anesthesiologists to adopt preventative measures and ensure safer anesthesia induction [5].

Case reports

Acute psychosis following propofol in a patient with Parkinson's disease: effects of a GABA-dopamine imbalance [6].

Test and answers

What is the primary use of Propofol in clinical practice? a) Pain relief b) Induction and maintenance of general anesthesia c) Treatment of hypertension d) Treatment of epilepsy

What is the advantage of using Propofol for induction of anesthesia? a) It provides prolonged

anesthesia. b) It has a slow onset of action. c) It causes rapid loss of consciousness. d) It is available in oral form.

How does Propofol compare to some other anesthetic agents in terms of its duration of action? a) It has a longer duration of action. b) It has a shorter duration of action. c) It has no duration of action. d) Its duration of action depends on the patient's age.

What state does Propofol induce in patients during surgery? a) Euphoria b) Sedation and amnesia c) Hyperactivity d) Increased pain perception

How is Propofol administered during surgery? a) Orally b) Intramuscularly c) Subcutaneously d) As a controlled IV infusion

What is one of the common side effects of Propofol during surgery? a) Increased heart rate b) Hypertension (high blood pressure) c) Respiratory depression d) Elevated body temperature

What property of Propofol makes it useful in preventing postoperative nausea and vomiting? a) Analgesic effect b) Antidepressant effect c) Antiemetic properties d) Anticoagulant effect

What rare condition can occur with prolonged and high-dose use of Propofol? a) Hypothermia b) Propofol overdose c) Propofol-related infusion syndrome (PRIS) d) Propofol addiction

Which of the following statements about Propofol is true? a) It is commonly used as a standalone analgesic. b) It is available in various forms, including oral tablets. c) It is administered exclusively through IV injection. d) It is primarily used as an anticoagulant.

Why is Propofol known as the “milk of amnesia”? a) It has a white color. b) It is derived from milk. c) It tastes like milk. d) It causes amnesia-like effects.

Answers:

b) Induction and maintenance of general anesthesia c) It causes rapid loss of consciousness. b) It has a shorter duration of action. b) Sedation and amnesia d) As a controlled IV infusion c) Respiratory depression c) Antiemetic properties c) Propofol-related infusion syndrome (PRIS) c) It is administered exclusively through IV injection. a) It has a white color.

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