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Impact of urapidil and propofol on intraocular pressure and perioperative hemodynamics in patients undergoing anesthesia and extubation

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Abstract
Background and Objective: To contrast the effects of urapidil and propofol on intraocular pressure and hemodynamics in patients undergoing anesthesia and extubation.
Methods: 86 surgical patients (Class: ASA I-II) were divided into groups at random and given propofol (=43) or urapidil (=43). There was no discernible difference between the two groups in terms of their gender, age, body mass, length of surgery, or anesthetic dosage ($p>0.05$). Propofol (1.5 mg/kg) and urapidil (2.5 mg/kg) were administered to the patients in the appropriate groups. The two medications were diluted to a volume of 8 mL each using normal saline. After that, patients received gradual intravenous injections of the medications. Following therapy, the patients underwent tracheal extubation, rapid suction, and ten minutes of oxygen mask wear. Using double-blind techniques, we measured the intraocular pressure (IOP), heart rate (HR), pH, PaO2, PaCO2, SaO2, and systolic and diastolic blood pressure (BP), as well as heart rate (HR), during the suction and five and ten minutes following the extubation. During the extubation, the total recovery time for the restless patients was also noted (on command, they could open their eyes and shake their hands). A professional statistical program called SPSS 15.0 was used to evaluate the data.
Results: Following extubation, the propofol group saw significantly fewer cases of cough, restlessness, and glossocoma than the urapidil group ($p<0.05$). Hypotension, laryngospasm, or severe respiratory depression were not observed during any of the episodes. Between the two groups, there was no statistically significant difference in recovery times ($p>0.05$). The BP and HR in the propofol group were considerably lower than those before providing propofol ($p<0.05$) and had a significant difference when compared with those in the urapidil group ($p<0.05$), although there was no significant difference between them during extubation and following induction. The urapidil group's blood pressure did not noticeably rise during aspiration or extubation in comparison to preinduction. Following urapidil administration, the HR of the urapidil group showed few changes and was clearly higher than it was prior to induction. In the propofol group, aspiration and extubation stimulation resulted in less cough and agitation than in the urapidil group ($p<0.05$). When compared to preinduction, the IOP of the propofol group did not clearly increase upon extubation, whereas the urpidil group experienced a significant ($p<0.05$) increase in IOP following extubation. There was no discernible difference between the two groups' changes in these indicators ($p>0.05$).
Conclusion: Propofol prevents the cardiovascular and stress reactions better than urapidil, and it also causes an increase in intraocular pressure (IOP) in ophthalmic patients during emergence and extubation. Furthermore, it doesn't affect the patient's ability to heal.

Keywords: Propofol, urapidil, ophthalmic surgery, extubation, general anesthesia, hemodynamics, intraocular pressure

Introduction
The bulk of procedures pertaining to the eyes are only conducted under local anesthetic. For pediatric patients and postoperative analgesia, its regional anesthesia is also mentioned in conjunction with general anesthesia. For a long time, eye blocks were only used for retrobulbar anesthesia by surgeons [1-3]. Alternative analgesic approaches, such as intraocular lens implantation and cataract surgery anesthetic, have been developed as a result of surgical technique advancements aimed at improving patient safety during eye operations. Certain neurophysiologists propose that the effects of hemodynamic deprivation could be reversed when under anesthesia. However, it is unknown how anesthesia affects hemodynamic homeostasis. Surgery under general anesthesia is necessary for treating eye tumors and trauma.

Heart rate, blood pressure, or any other stress response is not triggered general anesthesia during the agitated awake period. Patients with heart problems, myocardial ischemia, hypertension, and cardio-cerebral vascular accidents may benefit from tracheal extubation. The results of eye surgery may also be impacted by elevated intraocular pressure. Cardiovascular medications are often used in clinical settings to lessen cycle fluctuations; however, in the absence of sedation, patients are unable to control restlessness.

In ophthalmic surgery under anesthesia, the extubation may be used. Following the general prerequisites for an eye block, a brief description of each technique was given, along with a discussion of its pros and cons. This study aimed to protect patients undergoing eye surgery from hemodynamic and intraocular pressure changes during extubation by administering propofol and urapidil intravenously both before and after the procedure. The impact of these two drugs on blood cycle, intraocular pressure, sedation, and regained consciousness were assessed.

Materials and Methods

A total of 86 patients (Class: ASA I -II) from were enrolled at Department of Ophthalmology, Sree Lakshmi Narayana Institute of Medical Sciences, Puducherry, India between July 2019 and June 2020. Of them, 36 instances involved women and 50 cases included men. The vitrectomy and open eye surgery for the orbital tumor were performed under endotracheal anesthesia. Prior to surgery, these individuals' routine exams and metabolic testing came back normal. Cardio-cerebrovascular diseases and organ problems were also ignored.

Thirty minutes before surgery, the patients got an intramuscular injection of phenobarbital (0.1 g) and a subcutaneous injection of scopolamine (0.3 mg). Vecuronium (0.1 mg/kg), propofol (2.0 mg/kg), and fentanyl (4.0 mg/kg) were given for induction. After that, the patients were placed on intubation. All patients had a local nerve block, an intermittent intravenous rocuronium injection, an isoflurane (20 g/L) inhalation, and an intravenous propofol infusion (5 mg/kg) per hour to maintain anesthetic effects. When the conjunctiva was sutured at the end of the procedure, the propofol was also stopped, as did the isoflurane inhalation. The patient's response doesn't seem to make sense at that point. During the final expiratory phase, a tidal volume (>6.0mL/kg) of isoflurane (Mass concentration, <2g/L) was given to reestablish spontaneous breathing until the swallow reflex and cough appeared. Two sets of 86 surgical patients were randomly assigned: 43 patients received propofol, and 43 patients received urapidil. When comparing the gender, age, body mass, length of operation, and anesthetic dosages between the two groups, there were no statistically significant differences (p>0.05). Patients in the respective groups received 1.5 mg/kg of propofol and 2.5 mg/kg of urapidil. Following an 8 mL dilution with normal saline, both drugs were gradually injected intravenously. Every patient had immediate tracheal extubation after therapy, and they were required to wear oxygen masks for ten minutes. Double-blind approaches were used to assess the following parameters: intraocular pressure, heart rate (HR), pH, PaO2, PaCO2, SaO2, and diastolic and distolic blood pressure (SBP and DBP), before induction medication, during suction, during extubation, and five to ten minutes after the surgery. For the patients who were restless during extubation, the entire recovery period (The point at which the patients could open their eyes and shake hands) was also recorded. Statistics for Analysis Variations between the two groups and between repeated measures obtained before and after treatment were analyzed, and the results were presented as mean ¾ standard deviation. For countable data, the 2 test was employed; for non-matched data, the -test and variance analysis were used. SPSS 15.0, a professional statistical program for Windows, was utilized. A significance threshold of less than 0.05 was used.

Result

Table 1: Patients' hemodynamic alterations upon receiving an injection of urapidil or propofol (n= 43, mean+ SD)

Group	Preinduction	Pretreatment	Aspiration	Extubation	Post-extubation (5 min)	Post-extubation (10 min)
Propofol SBP(mmHg)	131.1±9.4	152.2±9.8^{a}	132.2±9.2^{bc}	140.4±9.8^{b}	115.4±9.8^{c}	126.2±9.5
DSP(mmHg)	75.4±8.6	89.7±8.3^{a}	79.1±8.5^{bc}	80.2±8.8^{c}	78.1±8.7^{c}	75.2±8.9^{c}
HR Urapidil	79.6±9.3	90.2±9.8^{a}	89.7±7.9^{bc}	80.1±9.2^{c}	79.3±9.4^{c}	76.6±8.7^{c}
SBP(mmHg)	135.7±9.9	145.1±9.8^{a}	130.5±9.2^{cb}	130.5±9.4^{b,c}	125.4±9.8^{c}	132.2±9.1
DSP(mmHg)	72.6±8.8	88.2±8.7^{a}	77.2±8.5^{b}	80.6±8.9 ^{b,c}	75.4±8.3^{c}	75.2±8.9 ^{c}
HR	78.2±9.7	89.2±9.3^{a}	98.2±9.7^{bc}	81.7±9.8 ^{b,c}	86.7±9.6 ^{a}	77.9±9.2 ^{a}

Table 2: The variations in the ophthalmic patients' pH, PaO2, PaCO2, SaO2, and IOP following a propofol or urapidil injection (n= 43, mean+ SD)

Group	pH	PaO_2 (mmHg)	$PaCO_2$ (mmHg)	SaO_2 (%)	IOP (mmHg)
Propofol					
Preinduction	7.456±0.121	92.8±3.2	41.5±6.3	97.9±3.3	18.1±3.5
Extubation	7.695±0.133	95.2±2.3	45.6±5.6	98.1±1.9	19.4±3.4
10 min post-extubation	7.956±0.135	96.1±1.7	39.8±5.1	95.9±2.6	17.5±3.7
Urapidil					
Preinduction	7.815±0.101	97.2±1.5	40.9±6.4	97.9±3.3	17.8±3.6
Extubation	7.754±0.122	95.1±1.8	41.2±4.8	98.8±1.8	30.4±3.9^{a}
10 min post-extubation	7.864±0.132	96.4±1.7	40.8±2.9	97.1±2.9	19.3±3.8

^{a}p<0.01 *vs* preinduetion in propofol and urapidil

Following extubation, there were 2 cases (4.9%) and 11 cases (26.8%) of cough, 1 case (0.2%) of agitation, and 5 cases (12.2%) and 9 cases (22.0%) of tongue fall back among the patients in the propofol and urapidil groups. Based on statistical analysis, patients in the propofol group experienced significantly fewer episodes of cough,

restlessness, and glossocoma following extubation than patients in the urapidil group ($p<0.05$). Patients in the propofol and urapidil groups did not significantly differ in their recovery times (minutes) ($p>0.05$). There was no laryngospasm in two groups.

Hemodynamics and Blood Gas Analysis The differences in SBP, DBP, and heart rate for patients in the groups receiving propofol and urapidil before induction, before treatment, during suction, during extubation, and five and ten minutes after the extubation were summarized. The blood pressure and heart rate (BP and HR) in the group receiving propofol were significantly lower than those in the group receiving urapidil ($p<0.05$) and showed a significant difference between extubation and the following period. But no appreciable distinction was seen between them and the group prior to induction. When compared to preinduction, the blood pressure of the urapidil group did not significantly increase during aspiration or extubation. Patients who received urapidil experienced only minor alterations in their heart rate (HR), which was evidently greater than it was before to induction. Aspiration and extubation stimulation resulted in less coughing and agitation in the propofol group than in the urapidil group ($p<0.05$). None of the events included hypotension, laryngospasm, or severe respiratory depression. There was no statistical difference between the recovery times of the two groups ($p>0.05$). Comparing extubation to pre-induction values, the propofol group showed no appreciable increase in IOP; in contrast, the urpidil group saw a significant increase in IOP ($p<0.05$) following extubation. The variations in these indicators between the two groups did not differ noticeably ($p>0.05$).

The pH, PaO2, PaCO2, and SaO2 variations among patients in the propofol and urapidil groups did not differ significantly ($p>0.05$). Patients in the urapidil group had significantly higher IOPs during extubation, while patients in the propofol group did not exhibit any significant changes in IOP ($p>0.05$).

Discussion

Anaesthesia involves loss of awareness and protective reflexes, and the field of anesthesiology was founded with the goal of eliminating pain during surgery [2, 6, 7]. Uncertainty surrounds the biological mechanism of action of general anesthetics. Anesthesia is the term for the use of medicines or non-drugs to induce a total or partial loss of consciousness in order to accomplish painless operation. The science of anesthesiology seeks to reduce surgical discomfort, guarantee patient safety, and establish an environment that is conducive to healing.

Ophthalmic surgical operations are associated with a very low rate of general morbidity or death and have little effect on the system. Consequently, normal precautions like fasting are occasionally broken for ocular blocks in some countries [6, 7]. However, we think that normal safety procedures (Preoperative evaluation, hemodynamics, and monitoring) should be used when considering probable complications, as outlined in complications of injection blocks. Our research demonstrates that propofol is more effective than urapidil at preventing the cardiovascular and stress reactions as well as the increase in intraocular pressure that occurs during the emergence and extubation of an ophthalmic patient. Propofol also has no negative impact on the patient's ability to recover.

The effects of the anesthetics lessened and breathing may be resumed when patients came to during the general anesthesia period. The endotracheal tube stimulation was difficult for patients to bear since it gradually engaged the airway reflex. In addition to surgical local discomfort for the patient, which frequently results in hypertension, tachycardia, and other cardiovascular reactions, the suction, tracheal tube removal, and throat stimulation might trigger vagus nerve reactivity, such as adrenal system activation. Severe illness can cause a decrease in cardiac output and an increase in myocardial oxygen demand, which might increase the risk of problems after surgery. These reactions may be prevented and the cardiovascular response may be inhibited prior to extubation, local surface anesthetic, cardiovascular active medications, and adrenergic blockers. Deepening anesthesia can also be achieved by applying sedation and analgesia; however, this may lead to respiratory suppression, delayed recovery, and other complications prior to extubation [7-9].

Following the administration of propofol anesthetic dosages, there was a greater degree of hydroxylation in the metabolism of propofol. Additionally, there is inter-patient heterogeneity in the ratio of propofol's hydroxylation to glucuronidation, but this is unrelated to the drug's dosage. But the metabolite profile variation seen in this analysis does not appear to point to a larger role for metabolism in pharmacokinetic variability. Due to its strong protein binding, propofol is metabolized in the liver by conjugation [10]. Because it inhibits K+/ATP-mediated pulmonary vasodilatation, the medication intensifies hypoxic pulmonary vasoconstriction. Propofol's interactions with calcium channels or the -aminobutyric acid receptor account for the majority of its pharmacological effects. Propofol modulates presynaptic pathways of GABAergic transmission, but it also prolongs inhibitory postsynaptic currents mediated by -aminobutyric acid receptors, suggesting that its effects are related with greater inhibitory synaptic transmission. Propofol regulates the inflammatory response in the host in a number of ways. Since its rate of clearance outpaces the flow of blood via the liver, there may also be an extrahepatic site of elimination. It functions through a number of mechanisms [11, 10], including sodium channel blocker [11] and gamma-aminobutyric acid receptor activity potentiation [11], which slows the channel-closing time. Recent studies have also revealed that propofol's distinct qualities and anesthetic activity may be greatly influenced by the endocannabinoid system. Propofol's half-life of elimination has been calculated to be between two and twenty-four hours. However, because propofol diffuses quickly into peripheral tissues, its clinical effect lasts significantly shorter. A single dosage of propofol for IV sedation usually wears off in a matter of minutes. Propofol is a flexible medication that can be used for both general anesthesia and brief or prolonged drowsiness. Unlike many opioid drugs, its use is not linked to nausea. Its quick onset, quick recovery, and amnestic properties have made it a popular choice for sedation and anesthesia. In this trial, tracheal extubation was done at a dose of 1.5 mg/kg of propofol. The patients' anxiety and cardiovascular reaction were also successfully managed, and they did not exhibit any overt coughing. Propofol has a brief action time, which helps patients wake up rapidly.

One sympatholytic antihypertensive medication is urapidil. It functions as both an agonist and an antagonist of the 5-HT1A receptor. Despite an original report suggesting that urapidil was also a 2-adrenoceptor agonist, further

investigations that tested the drug's absence of agonist effects in the guinea-pig ileum and the dog saphenous vein did not support this theory. Because of its modest 1-adrenoceptor antagonist action and impact on cardiac vagal drive, urapidil does not cause reflex tachycardia like some other 1-adrenoceptor antagonists do [10, 12]. Patients' stress reaction was not inhibited by urapidil by itself. In our investigation, the use of urapidil during extubation resulted in a considerable degree of suppression of the cardiovascular reactions. Patients in the urapidil group who were extubated experienced significantly higher stimulation and problems, such as IOP pressure, cough, and anxiety, when compared to the propofol group (<0.05). Urapidil may therefore cause major side effects, including acute glaucoma, in anyone with suspected glaucoma.

Other general conditions may also need to be avoided, according the surgeon's instructions. For example, choroidal expulsive hemorrhage may be catastrophically caused by acute peak arterial hypertension. For obvious reasons, tremor and/or anxiety-induced restlessness could make the process difficult. It is important to avoid coughing because it causes head movement, which raises IOP to an extremely high and acute peak and can make surgery more difficult. The best "akinesia of the head" may be achieved with sedation, but because to the possibility of ventilatory depression in the absence of airway accessibility, it should be utilized with caution. Additionally, this method has a brief operating time and limits the amount of ocular tissue manipulation. Maintaining the stability of IOP, which needs to stay within the range of 10–21 mmHg, is crucial to ensuring the benefits of eye surgery [13–15]. During anesthesia, the patient should refrain from coughing, restlessness, nausea, and vomiting to stop the contents of the eye from seeping out of the incision. IOP can drop with propofol. Propofol has been shown in most trials to lower intraoperative pressure (IOP) resulting from intubation and extubation during general anesthesia. Propofol has a special benefit when used in ocular surgery [15–17]. The study's findings demonstrate that when propofol is used in anesthesia, the IOP can be kept steady prior to induction during extubation, ensuring the safety of the procedure and the patient's stability during the tracheal extubation period, depending on the surgeon's wishes. The surgeon will ask for analgesia, akinesia, and hypotonia of the eyeball during an open eye procedure. The idea of IOP is non-existent since the eyeball is open. What level of anesthesia is required for surgery within the eye? Whether surgery is "open" or "closed" will determine this [16-17]. We think that sedatives given during tracheal extubation can prevent unfavorable reactions during the procedure and keep the IOP stable for eye surgery. Propofol is a safe and effective medication when compared to urapidil, and there are no notable side effects during anesthesia or extubation.

Conclusion

Propofol is more effective than urapidil at preventing the cardiovascular and stress reactions, and it also causes an increase in intraocular pressure (IOP) in patients undergoing emergence and extubation. Furthermore, the patient's recuperation is unaffected.

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