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Original research article

A study on the impact of urapidil and propofol on intraocular pressure and perioperative hemodynamics in patients during anaesthesia and extubation

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Abstract

Background: Ophthalmic procedures are usually associated with minimal systemic effects. The study was conducted to assess the systemic effects of urapidil and propofol when given intravenously in patients.
Method: 60 patients (ASA grade I- II) were divided into two equal groups randomly and were given propofol (n=30) or urapidil (n =30). The study was conducted in the Department of Anaesthesia, Kakatiya Medical College over a period of one year from April 2023 to March 2024. Patients were given propofol (1.5mg/kg) and urapidil (2.5 mg/kg) intravenously and systemic effects of the medication were observed.
Results: There was no significant difference between the two groups in terms of their demographic data, duration of surgery, or dose of the anaesthetic agent ($p>0.05$). After extubation, cough, restlessness was significantly less in the propofol group ($p<0.05$). Difference in the recovery times was not significant. Significant reduction of blood pressure and heart rate were seen peri-operatively in propofol group than in urapidil group.
Conclusion: The prevalence of cardiovascular events is low with propofol although an increase in the intra-ocular pressure (IOP) is observed in patients during emergence and extubation.
Keywords: Propofol, urapidil, ophthalmic surgery, extubation, anaesthesia, hemodynamics, intraocular pressure

Introduction

The majority of ophthalmic surgeries are performed under local anaesthesia, though for paediatric cases regional anaesthesia is sometimes used along with general anesthesia [1]. Retro bulbaranaesthesia administered by surgeons was previously the main technique, but new surgical methods have led to alternative anaesthetic approaches [2, 3].

While anaesthesia may help counteract hemodynamic effects, its impact on homeostasis is unclear. General anaesthesia is required for more complex procedures involving eye tumors and trauma. Extubation after general anaesthesia does not trigger stress responses in the awakened patient, making it beneficial for those with certain cardiac conditions like myocardial ischemia, hypertension, and cerebrovascular issues [4, 5].

Eye surgery can increase intraocular pressure, so managing this is important for successful outcomes. Although cardiovascular drugs clinically stabilize fluctuations, but make the patient restless as it doesn't have sedative effect [5]. The study evaluated the effect of propofol and urapidil on the cardiovascular hemodynamics, blood gas parameters and intra-ocular pressure when given intravenously before and after extubation in ophthalmic surgery.

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Materials and Methods

This observational study was conducted in the Department of Anaesthesiaover period of 121 months, i.e. from April 2023 to March 2024. The study included all patients who were to undergo surgery under general anaesthesia and required intubation.

Ethical committee approval was taken prior to the start of the study, a written informed consent was taken from all the patients after informing them regarding the procedures and the risks associated with it. Patients who did not give consent to participate in the study were excluded. Vitrectomy and open eye surgery for orbital tumors were performed under endotracheal anaesthesia.

A detailed history with special emphasis on any history of previous surgeries that required general anaesthesia or, history of anaphylaxis to any of the anaesthetic agents was taken for all patients. A generalised and systemic examination was done to rule out any abnormalities.

Patients received phenobarbital (0.1 mg intramuscularly), scopolamine (0.3 mg subcutaneously), vecuronium (0.1 mg/kg), propofol (2.0mg/kg), and fentanyl (4.0 mg/kg) before surgery, followed by intubation. Maintenance anaesthesia included nerve block, rocuronium (intravenously), isoflurane (20 g/L inhalation), and propofol (intravenous infusion @ 5 mk/kg/hour). Propofol and isoflurane were stopped at the end of the procedure. Isoflurane was used to re-establish breathing until reflexes returned.

Sixty patients were divided into two groups of 30 each, receiving either propofol or urapidil. Both drugs were diluted and injected intravenously. Post-surgery, patients had immediate tracheal extubation and wore oxygen masks for ten minutes. A double-blind study measured various parameters (intraocular pressure, heart rate (HR), pH, PaO_2, $PaCO_2$, SaO_2, and systolic and diastolic blood pressure (SBP and DBP) at different stages of the procedure. Statistical analysis was conducted using SPSS, with a significance threshold of less than 0.05.

Results

60 patients were included in the study after they consent for participation.

Table 1: Comparison of blood pressure and heart rate

	Propofol group (n = 30)			**Urapidil group (n = 30)**		
	Systolic blood pressure (SBP) in mm Hg	**Diastolic blood pressure (DBP) in mm Hg**	**Heart rate (HR) in beats/min**	**Systolic blood pressure (SBP) in mm Hg**	**Diastolic blood pressure (DBP) in mm Hg**	**Heart rate (HR) in beats/min**
Pre-induction	132.4±4.9 mmHg	74.5±6.8 mmHg	76.9±3.9 beats/min	137.5±8.9mmHg	76.2±6.8 mmHg	73.8±9.7 beats/min
Pre-treatment	155.1±8.9 mmHg	87.9±3.8 mmHg	92.0±8.9 beats/min	141.5±8.9 mmHg	82.8±7.8 mmHg	82.9±3.9 beats/min
Aspiration	139.2±2.9 mmHg	71.9±8.5 mmHg	87.9±9.7 beats/min	135.0±2.9 mmHg	72.7±5.8 mmHg	92.8±7.9 beats/min
Extubation	144.0±8.9 mmHg	82.5±6.8 mmHg	81.0±9.2 beats/min	135.2±4.9 mmHg	86.6±8.8 mmHg	87.1±8.9 beats/min
Post-extubation (5 min)	114.5±8.9 mmHg	78.8±7.8 mmHg	73.9±4.9 beats/min	125.4±8.9mmHg	74.5±3.8 mmHg	72.5±9.4 mmHg
Post-extubation (10 min)	122.6±5.9 mmHg	72.5±9.8 mmHg	77.6±7.8 beats/min	133.4±8.4 mmHg	87.6±6.9 beats/min	77.9±8.4 beats/min

Table 2: Comparison of ABG parameters and intra-ocular pressure

	Propofol group (n = 30)				**Urapidil group (n = 30)**			
	pH	**PaO_2 (mmHg)**	**$PaCO_2$ (mmHg)**	**IOP (mmHg)**	**pH**	**PaO_2 (mmHg)**	**$PaCO_2$ (mmHg)**	**IOP (mmHg)**
Pre-induction	7.546±0.221	98.2±2.3 mmHg	42.5±5.6 mmHg	19.2±3.4 mmHg	7.185±0.20	97.8±2.4mmHg	41.2±5.9 mmHg	18.7±3.8 mmHg
Extubation	7.695±0.131	92.5±3.2 mmHg	45.8±5.5 mmHg	19.5±3.5 mmHg	7.475±0.225	95.7±2.8 mmHg	41.8±4.7 mmHg	31.2±3.4 mmHg
Post – extubation (10 min)	7.596±0.153	96.8±2.1 mmHg	38.9±5.3 mmHg	17.9±3.8 mmHg	7.48±0.321	96.8±2.7 mmHg	41.7±3.1 mmHg	19.7±3.4 mmHg

Table 3: Post extubation complaints

Complaints	**Propofol group**	**Urapidil group**
Cough	3	10
Agitation	2	2
Falling back of tongue (gloss coma)	6	9

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Patients of propofol group had significantly lesser complaints post extubation. No complaints of laryngospasm, hypotension or severe respiratory depression were reported. The difference between hemodynamic, blood gas analysis and intra-ocular pressure was not significant between the two groups.

Discussion

Ophthalmic surgical operations are associated with a very low rate of general morbidity or death and have little effect on the system. However, normal safety procedures (preoperative evaluation, hemodynamics, and monitoring) should be used when considering probable complications during procedures such as injection blocks.

The study indicates that propofol is more effective than urapidil in preventing cardiovascular stress reactions and increases in intraocular pressure (IOP) during the emergence and extubation phases in patients undergoing ophthalmic surgery. Propofol does not negatively impact patient recovery. During general anaesthesia, patients experience discomfort from the endotracheal tube, leading to hypertension and tachycardia due to airway reflex and local throat stimulation. These reactions can reduce cardiac output and increase myocardial oxygen demand, heightening postoperative complications. To counteract this, surface anaesthetics and cardiovascular medications can inhibit cardiovascular responses, although deepening anaesthesia with sedation and analgesia may induce respiratory suppression and delayed recovery [4, 5].

Propofol is metabolized in the liver through hydroxylation and glucuronidation, with a rapid clearance that suggests potential extra hepatic elimination [6]. Its effects are mediated through interactions with calcium channels and GABA receptors, enhancing inhibitory synaptic transmissions. Propofol influences the host's inflammatory response and acts through mechanisms involving sodium channel blockade and GABA receptor activity [6, 7]. Propofol's brief clinical effect is due to its quick diffusion into peripheral tissues, despite an elimination half-life ranging from two to twenty-four hours. The medication is favoured for its fast onset, quick recovery, and amnestic properties, and unlike many opioids, it does not cause nausea.

In this study, a 1.5 mg/kg dose of propofol managed patient anxiety and cardiovascular reactions during tracheal extubation without significant coughing. Propofol's short action time facilitates quick patient recovery. Urapidil, a sympatholytic antihypertensive, did not effectively inhibit stress reactions alone. While it suppressed cardiovascular reactions during extubation, patients in the urapidil group exhibited higher stimulation and complications, including increased IOP, cough, and anxiety. Urapidil may lead to severe side effects and is not as effective as propofol in this context [8].

Maintaining stable IOP within 10–21 mmHg is crucial for the success of eye surgery, and propofol has been shown to lower IOP during intubation and extubation under general anaesthesia [9, 10]. The study's findings suggest that propofol ensures patient stability and safety during tracheal extubation, facilitating eye surgery. The requirement for anaesthesia depth depends on whether the eye surgery is "open" or "closed." Sedatives during extubation can prevent adverse reactions and maintain IOP stability. Overall, propofol is a safe and effective choice compared to urapidil, with minimal notable side effects [11, 12].

Conclusion

Propofol is superior to urapidil in preventing derangements in cardiovascular hemodynamics and to avoid stress reactions while extubation. Although, it comes at the cost of raised intra-ocular pressure during emergencies and extubation.

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Conflict of interest: No conflicts of interest declared

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