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The Comparison of the Influence of Thiopental and Propofol on Intraocular Pressure during Induction of Anesthesia in Intubated Patients under Cataracct Surgery

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ABSTRACT

The prevention of the increase of intraocular pressure and the further decrease of it during eye surgery has an impressive effect on the success of surgery. Some of the phases of the induction of anesthesia like laryngoscopy and tracheal intubation result in the increase of intraocular pressure and its consequences are dangerous for penetrating injuries of eyeball. The goal of this research is the comparison of the changes of intraocular pressure during the induction of anesthesia in completely same conditions by using thiopental and propofol and also the careful investigation of their influences on intraocular pressure in order to select the medicine that effectively decrease the intraocular pressure and prevent the increase of it after laryngoscopy and tracheal intubation. In this research, 88 patients were selected and they were randomly divided into 2 groups. In the beginning of the patients' anesthesia, both groups were preoxygenated and they simultaneously receive initial dose of atracurium (0/5 mg/kg) and then initial dose of fentanyl (1-2 μg/Kg). After prescription of fentanyl, the induction of anesthesia in the first group was done withthiopental (4 mg/kg) and in the second group with propofol (2/5 mg/kg) and after that, atracurium intubation (0/7 mg/kg) was prescribed. Intraocular pressure is measured in two phases before induction of anesthesia (with tetracaine eyedrop) and 3 minutes after intubation (with schiotz tonometer and 3±0/75 degree of accuracy) and by a person who is not aware of the kind of anesthesia. The patients are replicated in 2 experimental and control groups in terms of age and gender. The results of independent t-test show that there is no significant difference between 2 groups of thiopental and propofol in terms of systolic and diastolic blood pressure, heart beat and eye pressure before the induction of anesthesia (p-value>0,05). The results of independent t-test show that there is a significant difference between2 groups of thiopental and propofol in terms of diastolic blood pressure and eye pressure after the induction of anesthesia (p-value<0,05). But there is no significant difference between 2 groups of thiopental and propofol in terms of systolic blood pressure and heart beat after the induction of anesthesia (p-value>0,05). After the induction of anesthesia, the amount of systolic blood pressure and eye pressure was higher in thiopental than propofol. Propofol results in the decrease of intraocular pressure more than thiopental and it effectively prevents the increase of intraocular pressure after laryngoscopy and tracheal intubation

Key Words: intraocular pressure, induction of anesthesia, thiopental, propofol

INTRODUCTION

Intraocular pressure is always problematic for surgeons in intraocular surgeries and the prevention of the increase of intraocular pressure and its control arerequired [1]. Therefore, this issue i.e. the changes of intraocular pressure during eye surgery especially when the patient is under general anesthesia, is really important [2]. In the overall,department of anesthesiology must control intraocular pressure in the phases before, during and after the eye surgery. The natural amount of IOP is about 12-20 mmHg and it is about 2-3 mmHg in periodic fluctuations and it is about 1-6 mmHg in state-dependent changes. The most important factors influenced on IOP are related to aqueous humor dynamics, choroidal blood-volume changes, central venous pressure and extra ocular muscle tone. Cough, strain, valsalva manoeuvre or even vomit can temporarily but clearly increase IOP [1]. During anesthesia, the increase of IOP can result in loss of vision. After opening the eye socket in surgery, IOP reaches to atmosphere pressure and the sudden increase of IOP can result in prolapsed of the iris and lens, and the decrease of discharge and vitreous [3]. laryngoscopy and tracheal intubation can clearly increase IOP [at least 10-20 mmHg] and it is possibly depended on cardiovascular sympathetic responses to tracheal intubation [4]. Some of the medicines such as propofol, fentanyl, esmolol, etomidate, diazepam and lidocaine were used for adjustment of these responses but these medicines do not consistently suppress the increase of secondary IOP to laryngoscopy [5]. The decrease of blood pressure after the induction of anesthesia with propofol is usually more widespread, severe and longer than induction with thiopental [6-8]. Unlike thiopental, tachycardia is not usually happened after the injection of propofol, in the other hand, the increase of blood pressure and heart beat after laryngoscopy and tracheal intubation during the induction of anesthesia with propofol is less than thiopental [6] and the increased blood pressure returns to the basic situation more quickly [9]. Propofol and thiopental can decrease IOP but their influences on the decrease of IOP is sometimes equal and sometimes more for propofol [10 and 11]. The researches done on the comparison of these 2 medicines were not in the same conditions and they couldn’t compare the influence of these 2 medicines [5 and 12-13]. In Mirakhur's research [1998] which is done on the comparison of the influence of thiopental and propofol in children, he showed that the children, who become unconscious with propofol, significantly become conscious sooner and propofol has better recovery than thiopental. The comparison of IOP in 2 groups of thiopental and propofol showed that the decrease of IOP in propofol group is significantly more effective than thiopental. But the injection of propofol can result in pain during injection up to 30% and the decrease of systolic arterial pressure [14]. The prevention of the increase of IOP and its decrease in eye surgery has an impressive influence on the success of surgery. Some of the phases of the induction of anesthesia such as laryngoscopy and tracheal intubation can result in the increase of IOP and its consequences are dangerous for penetrating injuries of eyeball. In this research, an attempt has been made to create the relatively same conditions and compare the influence of propofol and thiopental on IOP.

MATERIALS AND METHODS

The research methodology in this research is clinical trials. After asking the Ethics Committee of the University for permission and attracting the patients' satisfaction, the patients were divided into 2 groups and each group has 45 participants. The inclusion criteria are as follow: all 18 to 70 year old patients who are placed in ASA 1 (without any disease and healthy) and in ASA 2 (with mild systemic disease) and under general anesthesia. The exclusion criteria are as follow: all patients who have the background of systemic disease (cardiovascular, respiratoty, high blood pressure, diabetes and etc), glaucoma, eye surgery, use of medicines altering eye pressure such as timolol and etc and alcohol and lithium consumption. In the beginning of the patients' anesthesia, both groups were preoxygenated and they simultaneously receive initial dose of atracurium (0/5 mg/kg) and then initial dose of fentanyl (1-2 µg/Kg).After prescription of fentanyl, the induction of anesthesia in the first group was done withthiopental (4 mg/kg) and in the second group with propofol (2/5 mg/kg) and after that, atracurium intubation (0/7 mg/kg) was prescribed. Intraocular pressure is measured in two phases before induction of anesthesia (with tetracaine eyedrop) and 3 minutes after intubation (with schiotz tonometer and 3±0/75 degree of accuracy) and by a person who is not aware of the kind of anesthesia. The patients are replicated in 2 experimental and control groups in terms of age and gender. The changes of IOP in both groups during the phases before the induction of anesthesia and 3 minutes after intubation will be used for determining the process between 2 groups with duplicate data test. The comparison of IOP changes, blood pressure and pulse is done with means comparison test during different phases between 2 groups. The background variables of age and weight will be compared by means comparison test and gender will be compared by chi-square test.

Findings:
This research includes 2 groups of thiopental and propofol. The patients of propofol group were 45 and the patients of thiopental group were 43. The 2 groups were the same in terms of gender, height and weight (Tables 1 and 2).

Table 1: The comparison of thiopental and propofol groups in terms of gender

		group				p-value
		pofoul		teupental		
		N	%	N	%	
sex	male	19	42.2%	22	51.2%	0.343
	female	26	57.8%	21	48.8%	

Table 2: The comparison of thiopental and propofol groups in terms of age and weight

	group				**p-value**
	pofoul		teupental		
	Mean	SD	Mean	SD	
age	65.52	8.67	66.67	6.88	0.579
weight	63.39	8.07	66.32	11.28	0.271

The results of independent t-test show that there is no significant difference between thiopental and propofol groups in terms of systolic and diastolic blood pressure, heart beat and eye pressure before the induction of anesthesia (p-value>0.05 and table 3).

Table 3: The comparison of thiopental and propofol groups in terms of dependent variables before the induction of anesthesia

	group	N	Mean	SD	p-value
BP Before induction systol	pofoul	45	144.26	21.35	0.993
	teupental	39	144.30	20.74	
BP Before induction dystol	pofoul	45	88.17	11.46	0.851
	teupental	38	87.65	13.72	
heart beat Before induction	pofoul	45	74.84	15.04	0.348
	teupental	39	77.89	14.47	
Ocularpressure Before induction of anesthesia	pofoul	45	17.16	4.72	0.297
	teupental	43	15.93	6.17	

The results of independent t-test show that there is a significant difference between thiopental and propofol groups in terms of diastolic blood pressure and eye pressure after the induction of anesthesia (p-value<0.05 and table 4). But there is no significant difference between thiopental and propofol groups in terms of systolic blood pressure and heart beat after the induction of anesthesia (p-value>0.05 and table 4).Systolic blood pressure and eye pressure were higher in thiopental group than in propofol group after the induction of anesthesia.

Table 4: The comparison of thiopental and propofol groups in terms of dependent variables after the induction of anesthesia

	group	N	Mean	SD	p-value
Bp Three minutes after the laryngeal systole	pofoul	45	130.97	22.39	0.283
	teupental	38	136.63	25.23	
Bp Three minutes after the laryngeal. Dystole	pofoul	45	79.97	14.16	0.029
	teupental	35	88.14	18.75	
heart beat after	pofoul	45	72.68	16.24	0.280
	teupental	38	76.39	14.46	
Ocular Pressure Three minutes after induction	pofoul	45	11.72	6.35	0.003
	teupental	43	15.62	5.63	

DISCUSSION

The increase of IOP, heart beat and the mean arterial pressure after the tracheal intubation is a result of secondary sympathetic reflex responses to a severe irritation caused by intubation and it is also possible to be happened without cough reflex. Regardless of the depth of anesthesia, these responses can peripherally decrease by the adjustment of afferent arm of reflex arc of local anesthesia, area blockers, or the adjustment of the efferent arm of beta blockers or calcium channel blockers, vasodilators or muscle relaxants. The weakening of central nervous system, as a part of reflex arc, is caused by deeper levels of general anesthesia [15]. As mentioned in this research, propofol decreases

IOP more than thiopental and prevents its increase after laryngoscopy and tracheal intubation. The results of the present research have a significant relationship with Scheller et al [16] and Hasani et al[15]. Scheller showed that alfentanil with propofol is an effective medicine combination for the induction of anesthesia without using muscle relaxants. The results of the present research support this hypothesis that propofol is effective in suppression of the increase of IOP after laryngoscopy. Richard and Hommand reported that propofol and alfentanil decrease IOP more than thiopental and suxamethonium and it is consistent with the present research [17]. In Tatiana Ferreira research which is done on the influence of 3 medicines of ketamine, propofol and thiopental on IOP, she showed that propofol and thiopental significantly decrease IOP more than ketamine during rest [18]. In Jalali et al research which is done on the comparison between the influence of etomidate and propofol on IOP for the induction of anesthesia in cataract surgery with phacoemulsification, they showed that etomidate can be used as an effective medicine for the induction of general anesthesia in cataract surgery and it has no clear clinical impact on IOP and the patient's hemodynamic status [19]. In Schaeuble et al research which is done in New Zealand in order to compare the influence of etomidate and propofol on control of airway and fiberoptic intubation in a form of double blind clinical trials, they showed that etomidate results in a faster return of respiration than propofol in nasotracheal fiberoptic intubation after the induction of anesthesia [20]. In 1995, in Cullen and Moffat research which is done on the comparison of 2 standard techniques of general anesthesia in patients under cataract surgery, they showed that in patients over 60, the use of etomidate, isoflurane and vecuronium are more preferred than propofol for the induction of anesthesia [21]. Mirakhur and Sheferd, in their researches done between 1985 and 1988, recommended propofol as a short-acting intravenous anesthetic for patients who have the increase of IOP or for patients who are under eye surgery. They reported that propofol decreases IOP and minimizes the increase of IOP caused by laryngoscopy and intubation after succinylcholine, vecuronium or without cricoids pressure [22]. In another research done by Beck and Masterson, they showed that propofol and alfentanil can create conditions similar to thiopentone and suxamethonium during intubation without neuromuscular interruption and without increase of IOP [22]. In 1993, Artu has done a research on the mechanism of the decrease of IOP by propofol and investigated the propofol influence on the production speed of intraocular fluid and its exit speed from the eye and intraocular compliance. He found that propofol decreases the production of intraocular fluid and also decreases the exit of fluid from the eye. But due to the fact that the decrease of the production of intraocular fluid is more than the decrease of the exit of fluid from the eye, propofol decreases IOP [23]. Richard and Hommand also showed that the combination of propofol and alfentanil decreases IOP and this issue is useful in patients with penetrating ocular lesions [24]. The results of this research showed that propofol decreases IOP more than thiopental and also it suppresses the increase of IOP after laryngoscopy and tracheal intubation. It is necessary to mention that deep anesthesia must be happened while using of non-depolarization muscle relaxants in order to prevent the increase of IOP. The use of medicines such as drugs is also important.

CONCLUSION

Propofol decreases IOP more than thiopental and it effectively prevents the increase of IOP after laryngoscopy and tracheal intubation.

REFERENCES

[1] Miller RD.Anesthesia.6th ed.usa,Churchill livingstone,2005;2351-2353.
[2] Donlon JR.Anesthesia for eye,ear,nose and throat.In:Miller RD,ed.Anesthesia, 5th ed.philadelphia:Churchill livingstone;2000:2173-2199.
[3] Barash PG,Cullen BF,Stoelting RK.Clinical anesthesia.4th ed.usa,Lippincott Williams and Wilkins,2001;pp:971-972.
[4] Cunningham AJ,Barry P.Intraocular pressure-physiology and implications for anesthetic management.can J anaesth 1986;33:195-198.
[5] Zimmerman A.andrew:propofol and alfentanil prevent the increase in IOP caused by succinylcholine and endotracheal intubation.anesthesia and analgesia.1996,83:814-817
[6] Reves JG,Glasspeter SA.Intravenous non-opioid anesthetics.6th ed.philadelphia:elsivier INC;2005. P 350
[7] Jones D,Prankerd R,Lang C,Chilvers M,Bignell S,Short T.propofol-thiopentone admixture-hypnotic dose,pain on injection and effect on blood pressure.Anaesth intensive care 1999;27:346-56.
[8] Moore J,Bill KM,Flynn RJ,Mckeating KT,Howard PJ.A comparison between propofol and thiopentone as induction agents in obstetric anesthesia.anesthesia 1989;44:753-7.

[9] Gin T,Gregory MA,OH TE.the haemodynamic effect of propofol and thiopentone for induction of cesarean section.Anesth intensive care 1990;18:175-9.
[10] Miller R:" anesthesia".5th edition.churchill livingstone,new york.2000 pp:2176-8.
[11] Miller R:"anesthesia".4th edition.churchill livingstone,new york.pp:269-274,1994.
[12] Richard JP,Hommand JS:IOP descrease during intubation under propofol.BRJ anesthesia.1995,75:657-658.
[13] Moffat A,Cullen PM:comparison of two standard techniques of general anesthesia for day-case surgery.BR J anesthesia.1995,74:145-148.
[14] Mirakhur RK, Shepherd WFI. Intraocular pressure changes with propofol ('Diprivan'): comparison with thiopentone. Postgraduate Medical Journal 1985*;* 61 *(*Suppl. 3*):* 41–4.
[15] Hassani V, Mirsamadi M, Moazzani Z. COMPARISON OF THE EFFECTS OF THIOPENTAL AND PROPOFOL ON INTERAOCULAR PRESSURE DURING THE INDUCTION OF ANESTHESIA. Journal of jiums,2000; Vol 7 . No 21:191-195.
[16] Richard, J.P. Hommand, J.S: "IOP decreases during intubation under Propofol", Br J Anesthesia. 1995, 75:657-658.
[17] Scheller, M. Zornow, M. Saidmanl: "Tracheal intubation without use of muscle relaxant: a technique using propofol and varying doses of alfentanil", Anesth Analg. 1992, 75: 788-93.
[18] Ferreira TH, Brosnan RJ, Shilo-Benjamini Y, Moore SB, Hollingsworth SR. Effects of ketamine, propofol, or thiopental administration on intraocular pressure and qualities of induction of and recovery from anesthesia in horses. Am J Vet Res. 2013 Aug;74(8):1070-7. Doi: 10.2460/ajvr.74.8.1070.
[19] Jalali A. R, Naderi M, Jadidi Kh, Zakeri A, Rafizadeh P. Comparing the effect of Etomidate and Propofol for induction of anaesthesia on intra ocular pressure of eye in cataract surgery by Phaco method. Kowsar Medical Journal,2010; 15(1): 43-47.
[20] Schaeuble J, Heidegger T, Gerig HJ, Ulrich B, Schnider TW. Comparision of etomidate and propofol for fibreoptic intubation as part of anairway management algorithm: A prospective, randomizes, double-blind study. Eur J Anaesthesiol. 2005;22(10):762-7.
[21] Moffat A, Cullen PM. Comparison of two standard techniques of general anaesthesia for day-casecataract surgery. Br J Anaesth. 1995;74(2):145-8
[22] Mirakhur RK, Sheferd WFI.Interaocular pressure change with propofol,Comoarison with thiopental post grad.med j 1985;61:4-4.
[23] Artu AA.Trabecular out flow facility and formation rate of aqueous humor during propofol. Nitrous oxide,And halothane anesthesia in rabbits. Anesthesia & Analgesia.1993;77:3.
[24] Richards jp, Hammond JS. Intraocular pressure decreases during intubation under propofol. BR A Anes.1995:75:5.