International Journal of Medical Toxicology & Legal Medicine Volume 27, No. 3, 2024
e-ISSN: 0974-4614
p-ISSN: 0972-0448

Use of Lidocaine with Bupivacaine in Peribulbar Block as Adjuvant to General Anesthesia in Comparison to General Anesthesia in Adult Strabismus Surgery

Noha Mohamed Abdelwahab[1], Amira Aboelnasr Awad[1], Manal Foad Abdelmoniem[1], Hanan Saied Mohamed Hegazy[2], Rasheda Elsaid Azzam[1],Abeer Elsayed Abdellatif Farhat[1], Nashwa Mohammed Ibrahiem[1], Gihan Eissa Zahran[1], Nesma Sayed Mohammed[2],Mohammad Moataz Mohammad Murad[3]

[1]Anesthesia, ICU and Pain management Department, Faculty of Medicine, Al-Azhar University ,Cairo ,Egypt.
[2]Ophthalmology Department, Faculty of Medicine, Al-Azhar University,Cairo ,Egypt.
[3]Research Institute of Ophthalmology, Glaucoma and Optic nerve department, Giza, Egypt.

Received: 03.08.2024 Revised: 25.08.2024 Accepted: 04.09.2024

ABSTRACT

Background: In recent years due to its lower hemodynamic events of regional anesthesia compared to general anesthesia, become more widely used in strabismus surgeries. Oculocardiac reflex is one of the main challenges events during ocular surgery.

Goal: In adult strabismus surgery, The purpose of the study was to evaluate peribulbar block's effectiveness and safety of combined general anesthesia and peibulbar block injection utilizing local anesthetics (lidocaine, bupivacaine, and hyaluronidase) vs general anesthesia alone. Techniques one hundred individuals with ASA-I and II in total were scheduled for strabismus surgery using either general anesthesia alone (group G = 50 patients) or general anesthesia plus peribulbar injection block (group P = 50 patients).

Results: The incidence (PONV) varied in a statistically significant way between the two teams. In addition, group (G) saw a statistically significant higher incidence of OCR than group (P). At 4, 6, and 12 hours after surgery, group (P) postoperative VAS score was statistically significantly lower than group (G). Moreover, group(G)made the request for an analgesic before group (P) did.

Conclusions: Since peribulbar block lowers both the frequency of OCR and the post-operative pain score, it is a more effective and superior approach for adult strabismus surgery when used in conjunction with general anesthesia.

Keywords: Bupivacaine, Lidocaine, Peribulbar block, General anesthesia .

INTRODUCTION

A among of the most popular procedures performed on the eyes for strabismus. During strabismus surgery, extraocular muscle traction may cause the oculocardiac reflex (OCR)[(1).] The OCR arc is composed of an afferent and an efferent limb. The sensory efferent limb is the vagus nerve, and the sensory afferent leg is the trigeminal nerve. The ocular and periorbital tissues' stretch receptors are activated first, initiating the process. The ciliary ganglion receives the sensory message via impulses sent by the short and long ciliary nerves.

The ophthalmic division of the trigeminal nerve and the gasserian ganglion carry the impulses to the trigeminal nucleus in the central nervous system (CNS) where the afferent limb ends [(2)] ·After the CNS processes this sensory data, the trigeminal sensory nucleus and the visceral motor nucleus of the vagus nerve will internuclearlycommunicate[(3).]

Stimulated efferent limbs send impulses to the heart, where they join synaptically with the sinoatrial node to initiate the vagal motor response. Negative chronotropy is one of the effects, and it can lead to bradycardia. It is caused by extraocular muscular traction, especially of the medial rectus muscle, traction on the globe, and ocular pain [(4).]

In pediatric ophthalmic surgery, the use of a single injection with a small needle and modest volume in conjunction with general anaesthesia is a safe and effective approach [(5,6)]

The oculo-cardiac reflex (OCR) is highly risky for patients undergoing strabismus surgery. Overly dramatic OCR could be fatal. The key to lowering this risk is to continue using anti-cholinergic medications and maintaining an appropriate level of anaesthesia. Regular prophylaxis was unable to completely remove the danger of OCR·[(7,8).]

There is a link has been observed that suggests extra ocular muscle manipulation may worsen (PONV). [9, 10].
Aim of the work was to evaluate the peribulbar block's efficacy and safety if added to general anesthesia in adult strabismus surgeries .

Patients And Methods
The research was carried out between December 2020 and June 2022. at Al-Zahraa University Hospital, "Al-Azhar University," Cairo, Egypt, and involved 100 patients of both sexes with ASA I, II. Ages over 21 scheduled for horizontal muscle strabismus surgery. Following the approval of the research by the institution's ethical committee, patients given written informed permission. This randomized controlled study. Using software for random grouping produced by a computer. An impartial consultant who also oversaw the creation of the research medications maintains the confidentiality of the group assignment.

Inclusion Criteria
- Adult patients with comitant horizontal strabismus
- The age range is 21 to 60.
- (ASA) I &II
- Presented for elective peribulbar anesthesia strabismus surgery.

Criteria for Exclusion
- . Patients with restrictive or recurrent strabismus
- Patient uncooperativeness.
- Diseases of the nervous system.
- Disorders of the mind.
- Diagnosed coagulopathy or suspected.
- A documented allergy to the drugs being used.
- Ocular infection
- Concurrent glaucoma.

A random division of the patients into two equal groups of fifty each. The patient was instructed to fast for about eight hours before the day of the procedure. After consent, an intravenous access was established and a pre-anesthetic examination was completed. There was no premedication given to the patient before operation, All the baseline measurements were made, including the oxygen saturation (SpO2), mean arterial pressure (MAP), and heart rate (HR).
Group G: For strabismus surgery, a total of 50 cases underwent general anesthesia.
Patients were put into general anesthesia with fentanyl 1-2 mcg/kg and propofol 1-2 mg/kg, and a supraglottic device was inserted. (An appropriate size of laryngeal mask airway was used). By modifying the mixture of oxygen, air, and sevoflurane needed to maintain anesthesia depth.
A capnogram was attached. end-tidal carbon dioxide (ETCO2) ranging between 35 to 45 mmHg. Any type of arrhythmia or the oculocardiac reflex—an abrupt reduction in heart rate that is more than 20% of baseline—was observed. In case stopping stimulation by the surgeon proved to be ineffective, an intravenous injection of atropine 0.01 mg/kg was administered.
Sevoflurane was stopped after the procedure, and the LMA was removed. Patients were moved to the post-anesthesia unit(PACU) after surgery , then released to the ward, with the requirement that they remain under close observation for a full day.
A postoperative pain assessment was carried out. at 2, 4, 6, 12, 18, and 24 hours following the procedure by a visual analog score (VAS) anesthesiologist. 75 mg of diclofenac ampoule was injected intramuscularly if the visual analog score (VAS) was higher than 4. Both the total amount of analgesia required and the interval between the patient's admittance to the PACU and the first rescue analgesic were noted. patients who experienced recurrent episodes of vomiting or persistent nausea within an hour were given ondansetron 0.15 mg/kg.

Group P: A total of 50 patients had strabismus surgery while under general anesthesia and peribulbar block (PBB).
The peribulbar block was performed by the same surgeon using a disposable needle with a 25 gauge and a 25 mm length. The injection contained 90 IU of dissolved hyaluronidase in the vial along with 6 ml of a 1:1 mixture of bupivacaine 0.5% and lidocaine 2%. Because hyaluronidase works in the orbit, less local anesthetic is used there.
The needle is inserted slightly medially and cephalad after passing the eye equator while still parallel to the orbital floor. For forty seconds, the local anesthetic was injected gradually.
Upon confirmation that the eye is prepared for surgery, patients are placed under general anesthesia using the

same technique for anesthesia in group G.
The primary objective in both groups was the incidence of OCR in adults following strabismus surgery; the secondary outcomes included the amount of analgesics taken in the first 24 hours postoperatively and the PONV assessment.

The following information was gathered from each group
- Demographic information: age, height, weight, ASA, and length of operation.
- Hemodynamics: HR and MAP were measured at baseline before to surgery and at 5, 10, 15, 20, 25, 30, 45, 60, and 75 minutes following anesthetic induction.
The frequency of PONV or OCR.
Variations in VAS between the two groups: Following the procedure, an anesthesiologist measured and recorded the VAS score at 2, 4, 6, 12, 18, and 24 hours. The score ranged from 0 (no pain) to 10 (the worst agony possible).
- Duration of the first postoperative analgesic need.
- Analgesia consumption during first 24 hoursfollowing surgery:
Individuals who had a VAS score of four or above were given a rescue dose of analgesia using 75 mg of diclofenac sodium. Diclofenac sodium dosage total was noted /24 .

Sample size
This number of occurrences was adopted using the Medcalc 19 tool, which had an 80% power sample, a 95% confidence level, and a 5% alpha error. This study's sample size wasselected by considering the 13% prevalence of oculocardiac reflex (OCR) in cases with peribulbar block, Itwas founded on Gupta et al.'s earlier research. (17). See Machin et al. (18) for an equation explanation.

Statistical analysis
The statistical program for social sciences, version 23.0, from SPSS Inc. (Chicago, Illinois, USA), was used to analyze the data.. When it came to non-parametric (non-normally distributed) variables,It was displayed with the median and interquartile range (IQR)..The standard deviation (SD) and mean were utilized toexpress quantitative data. To furnish qualitative data, proportion and frequency were employed. For independent samples, the t-test and the Chi-square (x2) testdetermine any significance were the next tests that were run. Both the permitted margin of error and the confidence interval were set at 95%. The significance level was determined using the P value. A significant $P < 0.05$ was taken into consideration.

RESULTS

Table 1: Demographic information

		Group G	Group P	Test valve	p-value
Age (years)		35.1 ± 12.15	37.95 ± 9.65	1.299	0.197
ASA no. (%)	I	28 (56%)	21 (42%)	1.441	0.230
	II	22 (44%)	29 (58%)		
Weight (kg)		103 ± 10.22	104.5 ±11.65	0.684	0.495
Height (cm)		161.10 ±10.13	160.20 ± 4.72	-0.569	0.570
Surgical duration (min)		64 ± 27.33	65.00 ± 17.63	0.217	0.828

Demographic information of two groups as regard (age, ASA, weight, height, duration of operation) were comparable.

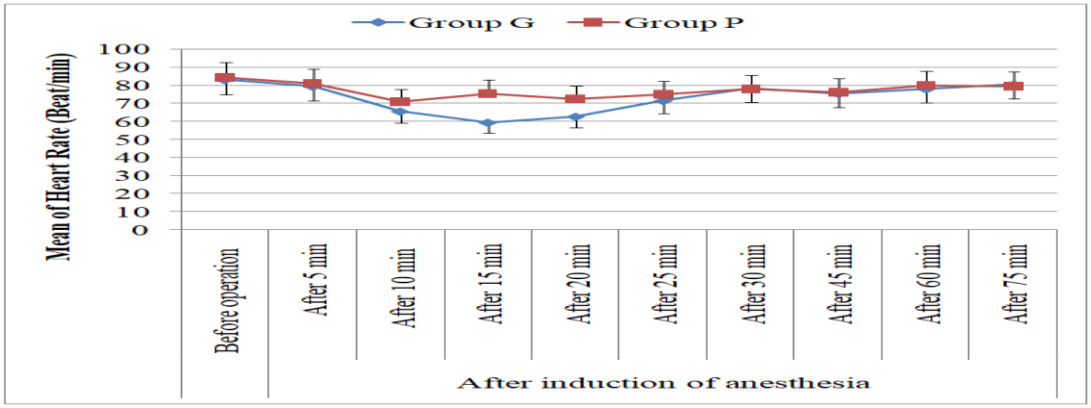

Fig. 1: Changes in HR in each group

Group G demonstrateda significant decrease in heart rate at 10, 15, and 20 minutes following the induction of anesthesia; however, For the remaining time intervals, there was no discernible difference between the two groups.

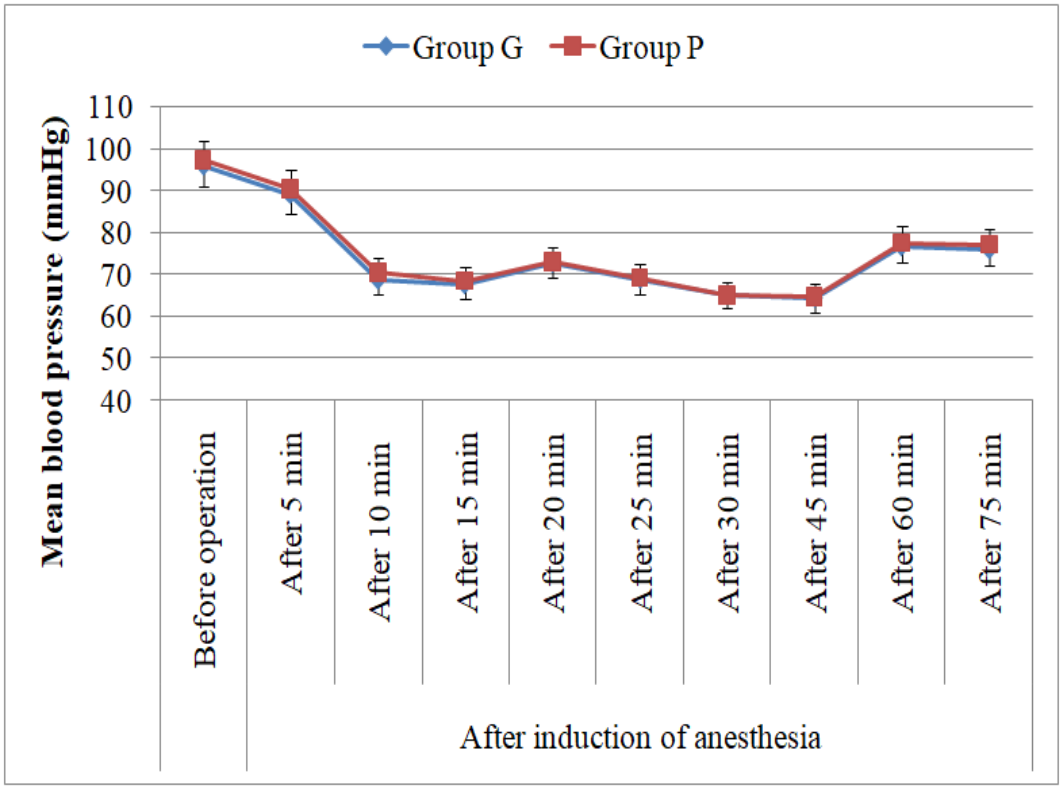

Fig 2: Changes in MAP in each group (mmHg)

Regarding MAP, no statistically significant difference was seen between the groups.

Table 2: the frequency of PONV or OCR

OCR and PONV incidence rates	Group G	Group P	Test value	p-value
OCR	9 (18%)	2 (4%)	4.955	0.026
PONV	16 (32%)	5 (10%)	7.221	0.010

Regarding the frequency of PONV or OCR, there was a significant statistical difference between the G and P groups.

Table 3: Comparison between both groups according toDuration of the first postoperative analgesic need& Analgesia consumption in the first 24 hours.

	Groups		Test value	p-value
	Group G	Group P		
First request of analgesia (hours)				
Mean±SD	4.93±0.86	8.86 ± 0.79	23.797	0.001
Total dose of Diclofenac (mg)				
Mean±SD	150 ±75	75±25	-6.708	0.001

Group P showed a late first request for analgesia than did in group G. The overall dose of postoperative analgesia was the lowest in group P compared with group G.

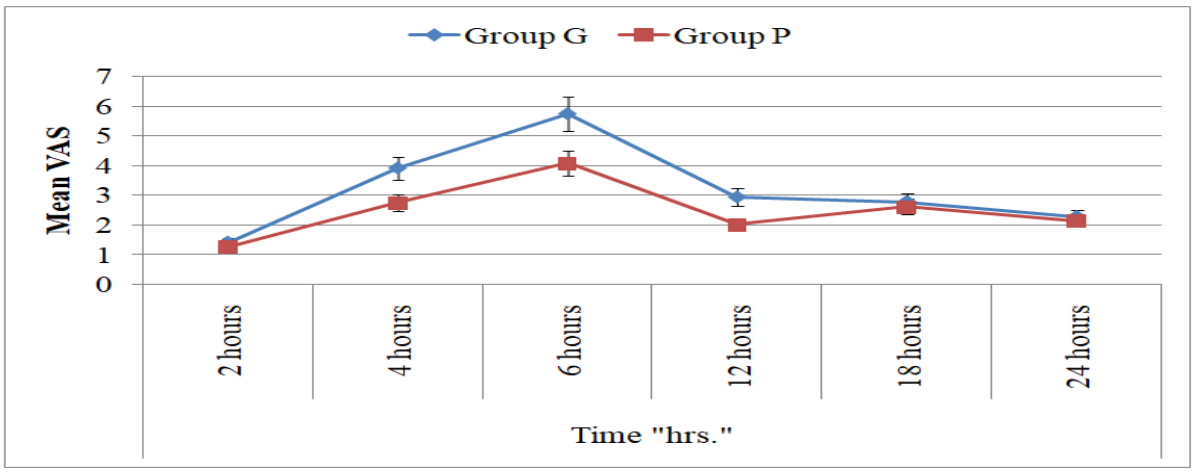

Fig. 3: Variations in VAS between the two groups.

At every time interval, group P, VAS pain score was lower than group G. However there was a statistically significant difference at 4, 6, and 12 hours.

DISCUSSION

The HR changes between the two groups revealed that group G possessed a greatly lower pulse rate at 10, 15, and 20 minutes after the induction of anesthesia. Nothing about the two groups was noticeably different at the other time intervals. The MAP revealed no statistically significant changes between the two groups.

A study [(11)] comparing GA with peribulbar block plus GA in young individuals undergoing ocular procedures found that the GA group had significantly lower MAP and HR values in comparison to the GA-PB group.($p < 0.05$).

The discrepancy in HR found in our research could be caused by the age differences we scheduled for the study.

OCR and PONV incidence increased considerably in the G group, which was statistically significant when compared with the P group. PONV is a common occurrence after eye surgeries.

Frequent vomiting can raise the expense of antiemetic medications and compromise the integrity of the corneal suture. [(12)]

In this study, the intraoperative OCR was managed using atropine 0.01 mg/kg and a request to the surgeon to cease surgical traction.

Study [(13)] examined 60 patients following primary retinal detachment surgery; the patients were assigned to receive GA-PB or GA alone. The results showed that the GA group had a higher frequency of OCR that required the administration of atropine. However, [(14)] who evaluated fifty children for elective eye surgery, twenty-five patients got intravenous pethidine (control group), and twenty-five patients were given PBB (block group) for perioperative analgesia. The block group had a significantly lower incidence of PONV and OCR.

Study [(15)] compared GA alone (group 1) versus GA-PB (group 2). They discovered that group 1 experienced a higher prevalence of OCR than group 2. (25.7% vs. 5.7%), which was statistically significant, $P = 0.022$. Furthermore, PONV frequency varied significantly between groups 1 and 2. (42.9% vs. 17.1%).

Study [(11)] showed that peribulbar block reduced the incidence of PONV and OCR. Another study by [(12)] found thatGA combined with peribulbar block in children having strabismus surgery decreased the frequency of OCR and PONV.

Our findings contradict [(16)] and [(17)], who used total intravenous anesthesia (TIVA) as an anesthetic method. There was no statistically significant difference in PONV between peribulbar block administered with GA as adjuvant and GA administered alone in ocular surgery; this was assumed to be due to propofol's antiemetic action.

With regard to the first analgesic request and the total amount of analgesic medication administered, the **G** group received it earlier than the P group.

When comparing the P and G groups, the total amount of analgesic medication given to the patients following surgery varied significantly.

Pain following surgery was successfully decreased by peribulbar block, as demonstrated by [(13)] as well as [(15)]. compared to the GA group, the GA-BP group had a far larger proportion of pain-free patients, and their duration until their first rescue drug was noticeably longer.

Additionally, the research of (20) and (18) shows comparable observed result .

When GA is compared with GA-PB in ocular surgery.

In our study, the group P had a lower VAS pain score than group G at all-time intervals, and there was a statistically significant difference at 4, 6, and 12 hours.

A study[15] concluded that PBB successfully minimizes postoperative pain since it decreases the VAS score during all assessed times.
Additionally, [14] demonstrated that the postoperative VAS scores of the kids in the block group were consistently lower.
[19] found that peribulbar block with 10 ml of 0.25% bupivacaine (block group) before general anesthesia resulted in a lower VAS score of 80% compared to 27% in the morphine group, which received 150 uq/kg intravenous morphine prior to GA.
In conclusion, PBB, when added to general anesthesia, lowers the incidence of PONV, OCR and VAS making it a considerable advantage over general anesthesia in strabismus surgeries.

Conflicting interests
No conflicts of interest

REFERENCES

1. Dunville LM, Kramer J. Oculocardiac Reflex. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2018; 4: 83-99.
2. Chung CJ, Lee JM, Choi SR, et al. Effect of remifentanil on oculocardiac reflex in pediatric strabismus surgery. Acta Anaesthesiol Scand 2008; 52: 1273-1277.
3. Yi C, Jee D. Influence of the anaesthetic depth on the inhibiton of the oculocardiac reflex during sevoflurane anesthesia for pediatric strabismus surgery. Brit. Journ. Anes. 2008; 101(2): 234-238.
4. Jeetinder KM, Aswini K, Preet MS, et al. Effect of peribulbarblock on emergence agitation in children undergoing strabismus surgery under desflurane Effect of peribulbar block on emergence agitation in children undergoing strabismus surgery under desflurane anaesthesia: anaesthesia, Southern African Journal of Anaesthesia and Analgesia, 2018; 24(5): 140-144.
5. Hamilton RC. Techniques of orbital regional anaesthesia. Br J Anaesth. 1995; 75: 88–92
6. Subhedar R, Borse Y, Patel S. Oculocardiac Reflex during Strabismus Surgery in Pediatric Patients: A Randomized Case-Control Study. Int J Sci Stud 2015; 3(9): 70-73.
7. Grover VK, Bhardwaj N, Shobana N, et al. Oculocardiac reflex. Peribulbar block or opioid-relaxant anaesthesia. Can J Anaesth 1998; 45: 706.
8. Lai YH, Hsu HT, Wang HZ, et al. The oculocardiac reflex during strabismus surgery: Its relationship to preoperative clinical eye findings and subsequent postoperative emesis. J AAPOS 2014; 18: 151-5.
9. Karanovic N, Carev M, Ujevic A, et al. Association of oculocardiac reflex and postoperative nausea and vomiting in strabismus surgery in children anesthetized with halothane and nitrous oxide. Pediatric Anesthesia, 2006; 16: 948-954.
10. Juan I, Lin M, Greenberg M, Robbins SL. Surgical and anesthetic influences of the oculocardiac reflex in adults and children during strabismus surgery. SurvOphthalmol. 2023; 68(5):977-984.
11. Elgohary MM, and HosnyS:Single-injection peribulbar block combined with general anesthesia in children undergoing ophthalmic surgery: A randomized controlled study , Egyptian Journal of Anaesthesia Volume 27, 2011 - Issue 2
12. Van den Berg AA, Lambourne A, Clyburn PA. The oculoemetic reflex: a rationalization of postophthamicanaesthesia vomiting. Anaesthesia1989;44:110–7
13. Ghali AM, El btarny AM. The effect on outcome of peribulbar anaesthesia in conjunction with general anesthesia for vitreoretinal surgery. Anaesthesia2010;65:249–53.
14. Deb K, Subramaniam R, Dehran M, et al. Safety and efficacy of peribulbar block as adjuvant to general anaesthesia for paediatric ophthalmic surgery. PaediatricAnaesthesia2001;11:161–7.
15. Ahmed RM, MomeehAM , Abu Eleinen GK ,BoulosLM;Comparative study between combined general anesthesia with peribulbar block versus traditional general anesthesia in patients undergoing strabismus surgery ,FUMJ, 2022,10(2), 7-13.
16. Chhabra A, Pandey R, Khandelwal M, et al. Anesthetic techniques and postoperative emesis in pediatric strabismus surgery. Reg Anesthesia Pain Med 2005;30(1):43–7.
17. Morel J, Pascal J, Charier D, et al. Preoperative peribulbar block in patients undergoing retinal detachment surgery under general anesthesia: a randomized double-blind study. Anesthesia Analgesia 2006;102:1082–7.
18. Shende D, Sadhasivam S, Madan R. Effect of peribulbar bupivacaine as an adjuvant to general anesthesia on postoperative outcome following retinal detachment surgery. Anesthesia 2000;55:970–5.
19. Shende D, Sadhasivam S, Madan R. Effect of peribulbar bupivacaine as an adjuvant to general anesthesia on postoperative outcome following retinal detachment surgery. Anesthesia 2000;55:970–5.
20. Subramaniam R, Subbarayudu S, Rewari V, et al. Usefulness of pre-emptive peribulbar block in pediatric viteroretinal surgery: a prospective study. Regional Anesthesia and Pain Medicine 2003;28:43–7.