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Effect of Dexamethasone as A Local Anesthetic Adjuvant for Peribulbar Block in Vitreoretinal Eye Surgeries

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ABSTRACT

Background: Off label use of dexamethasone as an adjuvant to local anesthesia has been utilized to prolong single injection techniques.

Objectives: To assess the beneficial effect of dexamethasone on peribulbar block in vitreoretinal surgeries.

Patients and Methods: Patients undergoing vitreoretinal surgeries were randomized into 2 groups (10 patients each). They were given peribulbar block in the form of single medial canthus injection in a mixture of 8-10 ml of lidocaine 2% and bupivacaine 0.5% added to hyaluronidase 30 IU given by 25G, 1" needle. Group 1 received the block in addition to 4 ml dexamethasone. All patients got preoperative sedation in the form of 20 mic fentanyl, 1 mg midazolam and 20 mg propofol.

Primary outcomes were onset of the block, pain during injection according to the visual analog scale (VAS) score, the need to supplement the block or sedation during surgery. Secondary outcomes were hemodynamics (heart rate, mean arterial blood pressure, oxygen saturation), patient satisfaction and surgeon satisfaction.

Results: The mean onset of sensory and motor block in group 1 was significantly less (6.2$\pm$1.9) than group 2 (9.9$\pm$0.3 minutes). The pain score in group 1 was significantly lower (4$\pm$0.8) than group 2 (6$\pm$0.9), and the need for supplementation of the block or sedation during surgery differed significantly between the groups in favor for group 1 where the need for both was much less.

Conclusions: Addition of dexamethasone to peribulbar block in vitreoretinal surgery speeds up the onset of the block and adds to its efficacy.

Keywords: dexamethasone, peribulbar, vitreoretinal.

INTRODUCTION

There have been major advances in every aspect of the management of the ophthalmic surgical patient. These include shift to day case and increased focus on the patient. Day case ophthalmic surgery under local anesthesia is now preferred by most patients, surgeons and other staff. It is associated with the least disruption to the patient's normal activity, besides decreasing the demand on limited health resources [(1)].

The goal of anesthesia for ophthalmic surgery is to provide pain free surgery, to facilitate the surgical procedure, to minimize the risk of systemic and local complications and also to reduce the risk of surgical complications. Most patients undergoing ophthalmic surgeries are elderly with multiple chronic diseases. This may increase their risk of morbidity and mortality under general anesthesia. Therefore, regional anesthesia is preferred over general anesthesia in patients undergoing ophthalmic operations [(2,3)].

The choice of anesthetic technique depends on some patient's factors as: the patient's ability to tolerate manipulations around the eye without blepharospasm, and to maintain the required posture for the duration of surgery. It also depends on some surgical factors: the type and size of the incision, the complexity of the procedure, the risk of complication, the duration of the operation and the experience of the surgeon [(4)].

Surgeries for posterior segment are lengthy procedures and associated with relatively significant postoperative pain. The addition of adjuvants to local anesthesia in peribulbar block could be a method to prolong the duration of the block. Many drugs have been added, such as adrenaline, sodium bicarbonate, hyaluronidase, narcotics and ketamine [(5-8)].

In recent years, dexamethasone, a potent long-acting glucocorticoid, has been studied as an adjuvant to local anesthesia in peripheral nerve blocks. It is a very potent, highly selective and has analgesic properties. Dexamethasone might improve the quality and duration of peripheral nerve blocks over local anesthesia alone. It may relieve pain by reducing inflammation and blocking transmission of nociceptive C fibers and by suppressing ectopic neuronal discharge, steroids induce vasoconstriction and decrease the systemic absorption of local anesthetics [(9-11)].

PATIENTS AND METHODS

Ethical approval:

This research work obtained an ethical approval from the Ethical Committee of the Research Institute of Ophthalmology and an informed written consent from each patient.

This prospective randomized study was carried out at the Research Institute of Ophthalmology, during the period from 2014 to 2015. Twenty adult patients (18-83 year), either sex, American Society of Anesthesiologists

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Classification (ASA Class) 1 and 2 undergoing vitreoretinal eye surgery under local anesthesia were included, excluding those patients with abnormal coagulation, history of severe reaction, allergy or other complications to local anesthesia, confusion or inability to communicate, uncontrolled tremors and inability to adapt acceptable positions.

Patients were divided into 2 groups, each of 10 patients; group 1 and group 2, both received single medial canthus injection by 25G 1" needle in the form of mixture of lidocaine 2% and Bupivacaine 0.5%, 10 ml in a ratio of 1:1 with 30 IU of hyaluronidase. In group 1, 4 mg of dexamethasone were added to the mixture.

Preoperative assessment was done, procedure was explained to the patients, IV line was secured, basic monitoring was attached and baseline heart rate, mean arterial blood pressure and oxygen saturation were obtained; just before giving the block and at regular intervals thereafter. All patients were premedicated by 20 µg fentanyl, 20 mg propofol and 1 mg midazolam given IV.

Primary outcomes to be assessed were pain during injection using VAS score, duration of sensory and motor block by requiring supplementation to the block or sedation during surgery, and onset of the block. Secondarily: hemodynamic parameters (heart rate and mean arterial blood pressure), duration of surgery, patient and surgeon's satisfaction were assessed (using a scale from 0 [total unsatisfaction] to 5 [total satisfaction]).

Three dependent variables: pain score, onset of block and need to supplementation were compared in the two techniques.

After collecting the relevant data, they were analyzed using SPSS software. Data were represented as means ± standard deviation (SD) and range for continuous data or as frequency and percentage for categorical data. Normality assumption was checked in continuous variables using Shapiro Wilk test. Statistical significance was determined using Fisher exact test for categorical variables, Mann Whitney U test for abnormally distributed continuous variable and independent t-test for the normally disturbed continuous variables. P value less 0.05 was considered significant.

RESULTS

The patients of both groups were comparable as regard to age and gender. Mean age ± SD (range) in patients in both groups was 58.8±9.8 (47-73), mean age in group 1 was 57.2±11.1 (42-73), and mean age in group 2 was 60.3±9.2 (46-72). Gender distribution in group 1 was 40% males and 60% females, in group 2, it was 30% males and 70% females.

Addition of dexamethasone significantly decreased the need for supplementation of the block between group 1 and 2; being much less in group 1 (Table 1).

Table (1): Comparison of the need for supplementation to the block between the two groups

Group	Need for sensory block		P value
	Yes	No	
	0	10	0.01
	6	4	

The pain score in group 1 was statistically significantly lower than group 2 (P<0.001) (Table 2).

Table (2): The difference between the two groups regarding pain score parameter (

	Group	N	Mean	Standard Deviation
Pain score (VAS)	1	10	4.0	0.8
	2	10	6.0	0.9

The mean onset of the block in group 1 was lower than in group 2 by a statistically significant difference (Table 3).

Table (3): Comparing the onset of the block between the two groups

	Group	N	Mean	Standard Deviation	P value
Onset of block	1	10	6.20	1.93	<0.001
	2	10	9.95	0.30	

There was no statistically significant difference in the average mean arterial pressure and pulse rate between the two groups (Figures 1 and 2).

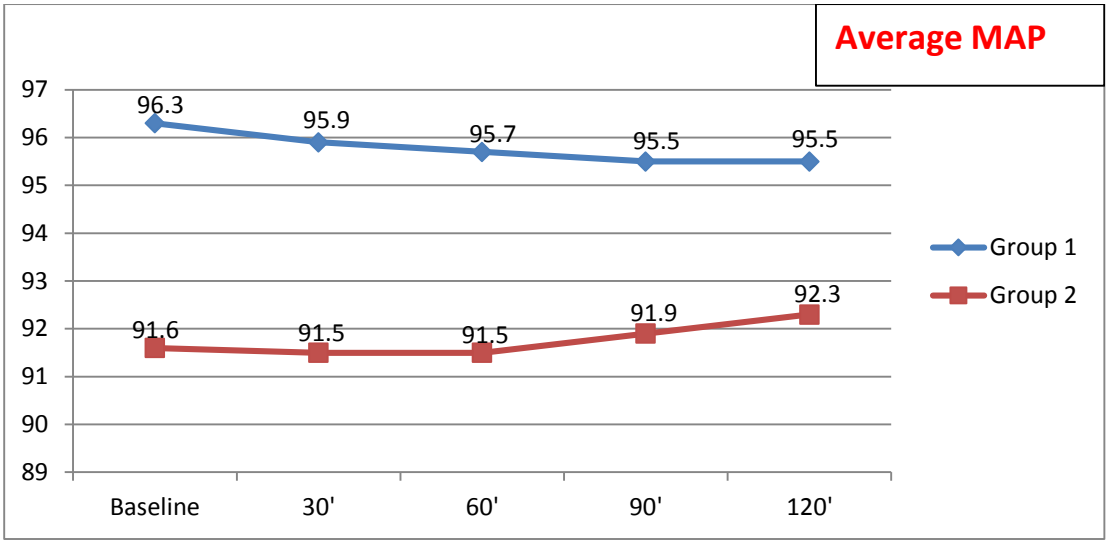

Figure (1) Comparison between the two groups regarding mean arterial pressure (MAP).

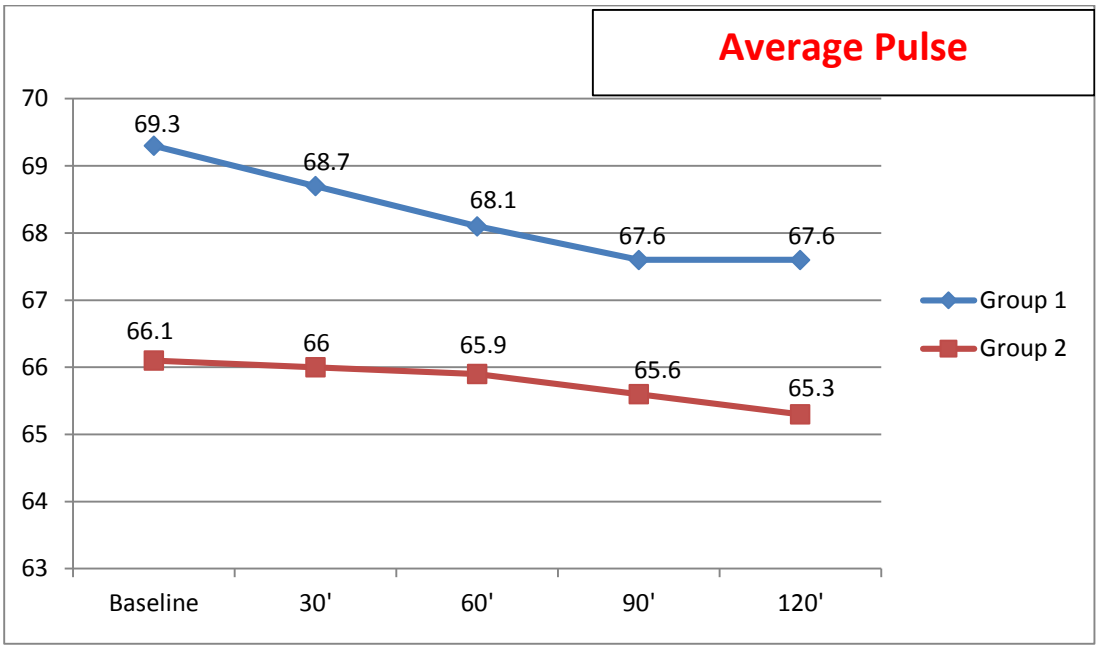

Figure (2) Comparison between the two groups regarding pulse rate.

Mean duration of surgery throughout the two groups was 111 minutes, mean patient satisfaction in group 1 was 4.9±0.3 and mean patient satisfaction in group 2 was 4.6± 0.5.

Mean surgeon satisfaction in group 1 was 4.9±0.3 and in group 2 was 5±0.

DISCUSSION

The majority of ophthalmic surgical procedures in adults are performed under local anesthesia. Optimal surgical conditions (analgesia and akinesia) can be obtained with block techniques avoiding the risks of general anesthesia for a population of patients who are often elderly with concurrent comorbidities [(12)].

Eye blocks have long been limited to retrobulbar anesthesia. Surgical techniques change and research on improving patients' safety during eye blocks have resulted in the development of alternative techniques such as peribulbar anesthesia, followed by subtenon block or topical anesthesia. Although the most classic peribulbar technique involves two injections, comparative studies have confirmed that, provided the injected volume is sufficient, the single injection technique is as effective as double injection technique, second injection should be performed only as a supplement when the first injection has failed [(13)].

Using only local anesthetics for peribulbar anesthesia is associated with delayed onset of globe akinesia and corneal anesthesia. Short duration of anesthesia and frequent need of block supplementation to decrease the time of onset of action and increase the duration of analgesia highlighted the need for additives. Many additives such as: clonidine, hyaluronidase, sodium bicarbonate, adrenaline and dexmedetomidine were added to local anesthetics [(14)].

In recent years; dexamethasone has been studied as an adjuvant to local anesthetics in peripheral nerve blocks. The mechanism of analgesia produced by corticosteroids is not fully understood. This effect is suspected to be mediated by their anti-inflammatory or immunosuppressive effects. They produce analgesia by blocking transmission in nociceptive C fibers and suppressing ectopic neuronal discharge. Steroids also might alter the function of potassium channels in the excitable cells [(9)].

A study by ***Engineer et al.*** used dexamethasone as an adjuvant to bupivacaine in upper limb surgeries performed under supraclavicular brachial plexus block where 2 ml of dexamethasone was added to 30 ml of 0.375 bupivacaine and concluded that dexamethasone produced faster onset of action, increased duration of sensory and motor block and duration of effective analgesia without any side effects being also safe and cost effective option for postoperative analgesia [(9)].

A meta-analysis by ***Choi et al.*** published in 2014 was performed to assess the effect of dexamethasone on brachial plexus block by comparing the contemporary literature. It postulated that dexamethasone improves quality and duration of perineural block over local anesthesia alone, thought to be mediated by attenuating the release of inflammatory mediators, reducing ectopic neuronal discharge and inhibiting potassium channel mediated discharge of nociceptive C fibers. It concluded that several studies reported that local anesthesia with perineural dexamethasone resulted in patients reporting qualitatively better analgesia or lower pain scores than without, with no reports of dexamethasone neuronal damage, stating that dexamethasone appears to be the best method to prolong analgesia as an adjuvant, over clonidine, epinephrine or midazolam [(10)].

A study performed by ***Mahmoud et al.*** aiming at assessing the efficacy of adding dexamethasone to peribulbar block in posterior segment eye surgery used a mixture of bupivacaine 0.5 and saline supplemented with 4 mg dexamethasone (in 1 ml) in contrast to the current study which used a 1:1 mixture of bupivacaine 0.5% and lidocaine 2% which is a local anesthetic that potentiates the effect of bupivacaine unlike normal saline that dilutes the effect of bupivacaine. The study concluded that adding dexamethasone to bupivacaine is safe with less postoperative pain and inflammatory response in posterior segment eye surgery [(5)].

Another study by **Alzeftawy and Blough-Elmourad** was performed to compare the effects of adding dexamethasone or dexmedetomidine to peribulbar block in patients undergoing vitreoretinal surgeries, concluded that the addition of dexamethasone or dexmedetomidine to local anesthetic mixture in peribulbar block provided safe and effective anesthesia with prolonged duration and decreased requirements of postoperative analgesia in contrast to the current study which assessed the effect of adding dexamethasone on the onset time of the block and the need for intraoperative supplementation to the block [(15)].

Conclusion

Adding dexamethasone as an adjuvant to the local anesthetic mixture of 1:1 bupivacaine 0.5% and lidocaine 2% in peribulbar block for patients undergoing vitreoretinal eye surgery was associated with decreased onset time to the block, lower pain scores and decreased need for intraoperative supplementation to the block or sedation.

Conflict of interest: The authors have no conflict of interest to declare.

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