Egyptian Journal of Anaesthesia (2013) **29**, 407–411

Egyptian Society of Anesthesiologists

Egyptian Journal of Anaesthesia

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Research Article

Dexamethasone bupivacaine versus bupivacaine for peribulbar block in posterior segment eye surgery

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Received 7 May 2013; revised 30 June 2013; accepted 13 July 2013
Available online 15 August 2013

KEYWORDS

Bupivacaine;
Dexamethasone;
Posterior segment;
Vitreoretinal;
Peribulbar block

Abstract *Aim:* The study conducted aims to assess the efficacy, time to first analgesic request, and postoperative inflammatory response after adding dexamethasone to local anesthetic mixture for a peribulbar block in posterior segment eye surgery.

Patients and methods: A double-blind randomized study was carried out on 50 ASA I and II patients scheduled for elective posterior segment surgery (vitreoretinal). Patients were allocated randomly into two groups, 25 patients in each group. Group I received equal volumes of 10 ml of a 1:1 mixture of bupivacaine 0.5% and saline, supplemented with 4 mg dexamethasone in 1 ml saline and group II received the same local anesthetic mixture (total volume 10 ml) without adding dexamethasone. The duration and onset of motor block, time to first analgesic request, postoperative inflammatory response, and other side effects such as nausea and vomiting were assessed.

Results: Patients receiving peribulbar block were significantly pain free by end of surgery (0 h) ($P < 0.05$) and throughout the postoperative period in the dexamethasone group at 2 and 6 h postoperatively. The number of patients requiring rescue analgesics was significantly lower with dexamethasone bupivacaine block ($P < 0.05$). The incidence of postoperative nausea and vomiting was significantly less in the first group (I) in comparison to the other group (II) ($P < 0.05$) and lastly the level of C reactive protein postoperatively was found to be significantly less in the dexamethasone group than the other one ($P < 0.0001$).

Conclusion: Adding dexamethasone to bupivacaine in peribulbar block appears to be a safe and clinically superior adjuvant with less postoperative pain, inflammatory response in patients undergoing posterior segment eye surgery.

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Peer review under responsibility of Egyptian Society of Anesthesiologists.

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1. Introduction

The majority of ophthalmic procedures are performed under local anesthesia as the patient being often elderly with inter-current diseases. Moreover, it is associated with less hemodynamic instability, less respiratory depression, better postoperative pain relief, and less nausea and vomiting than general anesthesia [1]. The lack of need to fast and the possibility for diabetics to remain on their normal regimes, the reduction in stress response, maintained oxygen saturation and cardiovascular stability, adding to this, the production of good akinesia and anesthesia alleviating occulo-medullary reflexes, all make local anesthesia more superior and safe technique [2].

Surgeries for posterior segment are lengthy procedures and associated with relatively significant postoperative pain [3]. The addition of adjuvant to local anesthesia (LA) in peribulbar block could be a method to prolong the duration of the block. Many drugs had been added including opioids, clonidine, ketamine, and dexamethasone. All could be injected either intrathecally, extradurally, or into the peripheral nerves [4,5]. Yet, all have side effects either hemodynamic instability, increased intraocular pressure, respiratory depression as well as gastro-intestinal side effects. Peribulbar block is a much simpler, rapid, and safe technique, especially in elderly patients [6] whom the use of general anesthesia and narcotics is usually done with caution.

Dexamethasone is a high potency, long acting glucocorticoid with little mineralocorticoid effect [7]. Glucocorticoids have been used to reduce inflammation and for prevention of postoperative nausea and vomiting; they are also effective in reducing postoperative pain and edema [8].

2. Patients and methods

Fifty adult patients, American Society of Anesthesiology (ASA) I or II, scheduled for elective vitreous body surgery or surgery for retinal detachment with or without scleral buckling were included in the study.

Patients were informed by the risks and benefits of peribulbar block. Patients were excluded from the study if they had any orbital deformity, high myopes, increased intraocular pressure, or if they were blind in the contralateral eye. Other exclusion criteria were known allergy to local anesthetics, contraindication to steroids, mentally retarded patients, or patient's refusal. The study was conducted at Aldemerdash hospital, ophthalmology operating theatre from June 2012 till January 2013.

After approval of the hospital medical committee, an informed consent was obtained from the patients. All patients were premedicated with oral midazolam 1–2 mg 1 h before applying the local anesthesia. Patients were randomly allocated to either of two groups using closed envelopes method. After routine monitoring, a medial canthus single peribulbar block was performed using a total volume of 10 ml of 0.5% bupivacaine local anesthetic added to it 4 mg dexamethasone disodium phosphate (in 1 ml) for the bupivacaine-dexamethasone group (group I, $N = 25$), while the other group received peribulbar block using 10 ml of 0.5% bupivacaine only (group II, $N = 25$).

Short beveled fine needles (25-gauge) were used for reducing pain on needle insertion and to enhance the tactile perception of resistance during needle insertion (intraneural or intramuscular placement). Ocular compression was performed for 5 min. Further intraoperative and postoperative monitoring was performed by investigators who were unaware of the group differences.

Hemodynamic variables (heart rate, systolic blood pressure, diastolic blood pressure) 5 min after administration of analgesic defined baseline were monitored continuously. Lid akinesia was assessed by asking the patient to open his eye lids and squeezing them together maximally. It was recorded as grade 1 if there was no resistance of the lids on attempted closure, as grade 2 if there was mild resistance of the lid margins, and as grade 3 if there was an appearance of creases at the outer canthus [10].

On the other hand, ocular motility was recorded for four quadrants, gaze in the superior, inferior, medial, and lateral directions, using a three-point scale system, where (0 = no movement, 1 = reduced movement, and 2 = normal movement). A score of up to 2 suggested a successful block [11]. The onset and duration of lid and globe akinesia were assessed.

At the end of the procedure, pain assessment was done (0 h, at end of surgery) then postoperatively at 2, 6, and 12 h. In each group, pain assessment using 10 points pain scale (VAS) and postoperative complications were assessed and compared.

Tool for pain assessment is the 0–10 Pain Scale (VAS), with numeric values ascribed to pain level, where 0 represents no pain and 10 is the worst pain imaginable.

Patients with VAS (pain score) more than 2 and up to 4 were treated by procetamol (1 g) intravenously. For a score of 4 or more, meperidine 1 mg/kg was administered by intravenous route and the patients transferred to the ward when comfortable.

Degree of postoperative inflammation was assessed among the patients and compared between the two groups, using level of C reactive protein which was measured preoperatively and 24 h postoperatively.

Postoperative nausea and vomiting was monitored and was managed by metoclopramide 10 mg intravenously.

3. Results

Fifty patients were enrolled in the study. Two patients from group I (bupivacaine–dexamethasone group) were agitated after local injection and received general anesthesia were excluded from the study. The two groups were comparable with respect to patients' demographic data and duration of surgery (Table 1). There was no statistically significant difference be-

Table 1 Demographic data and duration of surgery.

	Group I (dexamethasone + bupivacaine) $N = 23$	Group II (bupivacaine) $N = 25$
Age (years)	53.6 ± 12.3	56.2 ± 11.9
Weight (kg)	72.9 ± 9.5	69.7 ± 8.8
Sex (M/F)	13/10	11/12
Duration of surgery (min)	105.6 ± 27.3	111.3 ± 24.2

Data are expressed as mean + SD, or number percent.
$P > 0.05$ (non-significant).

Table 2 Onset of akinesia (globe and lid).

	Group I (dexamethasone + bupivacaine) $N = 23$	Group II (bupivacaine) $N = 25$	P value
Lid akinesia (min)	2.76 ± 1.1*	2.8 ± 1.2	$P = 0.905$
Globe akinesia (min)	7.6 ± 2.00**	8.14 ± 1.56	$P = 0.300$
P value > 0.05	Non-significant*	Non-significant**	

Data are expressed as mean + SD.

Table 3 Duration of akinesia (globe and lid).

	Group I $N = 23$	Group II $N = 25$	P value
Lid akinesia (min)	158.26 ± 13.42	148.52 ± 12.61	$P = 0.012$*
Globe akinesia (min)	188.16 ± 12.35	179.02 ± 11.58	$P = 0.011$
P value < 0.05	Significant*	Significant	

Data are expressed as mean + SD.

Table 4 Pain assessment at 2, 6, and 12 h postoperatively. (Number of patients who were pain free postoperatively).

Time	0 H	2 H	6 H	12 H
Group I (dexamethasone + bupivacaine) $N = 23$	21/23 (91.3%)	19/23 (82.6%)	21 /23 (91.3%)	23/23 (100)
Group II (Bupivacaine) N = 25	20/25 (80%)	12/25 (48%)	15 /25 (60)	23/25 (92)
P value	$P = 0.48$ Non-significant	$P = 0.027$* Significant	$P = 0.03$* Significant	$P = 0.507$ Non-significant

Data are expression as number percent.

tween the two groups as regard the onset of lid and globe akinesia ($p > 0.05$, Table 2).

The duration of lid akinesia was longer (158.26 ± 13.42 min.) in group I than in group II (148.52 ± 12.61 min.) and this was statistically significant ($P < 0.05$) (Table 3). Also, the duration of globe akinesia was longer (188.16 ± 12.35 min.) in group I than in group II (179.02 ± 11.58 min.) and this was statistically significant ($P < 0.05$) (Table 3).

Number of patients who were pain free was less in group II at 2, 6 h postoperatively, in comparison with group I and this was statistically significant ($P < 0.05$) (Table 4), and they were almost non-significantly different at 12 h duration postoperatively. The number of patients requiring postoperative analgesia at 2, 6 h postoperatively were significantly less in group I (bupivacaine–dexamethasone group) ($P < 0.05$) (Table 5); moreover, the time to first analgesic request was significantly longer in group I ($P < 0.05$) than in group II (Table 5).

The inflammatory response to the surgery was assessed postoperatively by measuring the levels of C – reactive protein which was significantly less in group I in comparison with group II $P < 0.05$) (Table 6). As regard postoperative nausea and vomiting, in group 1 (bupivacaine–dexamethasone group) only one patient developed nausea and vomiting while in group II 3 patients, and this was statistically non-significant ($P > 0.05$) (Table 7).

Results are expressed as means ± standard deviation (SD) or number percent (%). Comparison between numerical data was performed using student t-test. Comparison between categorical data was performed using the chi-squared test. Data were considered significant if p values were <0.05. Statistical analysis was performed with the aid of the MEDCALC computer program (version 12 windows).

4. Discussion

Our study was a prospective, double blinded, randomized study. The primary outcome was the effect of dexamethasone on the duration and quality of peribulbar block and the secondary outcome was the confirmation of the efficacy of adding dexamethasone for prolongation of postoperative analgesia and the anti-inflammatory effect as well. Dexamethasone was not used before as an adjuvant to local anesthetic for ophthalmic block but used alone intravitreally, subconjunctival, and in peribulbar injection [12].

The results of our study indicate that the addition of dexamethasone to bupivacaine for peribulbar block in posterior segment surgery had led to prolongation of duration of lid and globe akinesia; the time of first rescue analgesia was delayed together with prolonged postoperative analgesic duration indicated by prolonged duration of akinesia and VAS.

The result of our study is in agreement with the analgesia effects of preoperative administration of dexamethasone and other glucocorticoids given by oral, intravenous, intramuscu-

Table 5 Comparison between dexamethasone group and the bupivacaine group in no. of patients requiring analgesia postoperative (pain score > or equal 4 on VAS) also time for first analgesic request.

	0 H	2 H	6 H	12 H
Group I (Dexamethasone + Bupivacaine) ($N = 23$)	0/23 (0%)	2/23 (8.69%)	1 /23 (4.34%)	0/23 (0%)
Group II (Bupivacaine) ($N = 25$)	5/25 (20%)	11/25 (44%)	8/25 (32)	2/25 (8%)
P value	$P = 0.073$	$P = 0.015^*$	$P = 0.037^*$	$P = 0.5$

	Group I ($N = 23$)	Group II ($N = 25$)	P value
Time to first analgesia request (h)	3.15 ± 0.41	2.55 ± 1.32	$P = 0.042^*$

Data was expressed as mean ± SD, or number percent (%).
Statistically significant $^*P$ value < 0.05 significant.
P value < 0.05 = non-significant.

Table 6 Inflammatory response assessment postoperatively, using C reactive protein levels (μg/dl).

	Preoperatively	24 h Postoperatively
Group I (dexamethasone + bupivacaine) $N = 23$	1.39 ± 1.46	6.37 ± 2.11 μg/mL
Group II (bupivacaine) $N = 25$	1.62 ± 1.84	15.63 ± 3.14 μg/mL
P value	=0.635 Non-significant	$P < 0.0001$ highly significant

Data are expressed as mean + SD.

lar, or as an adjuvant to local anesthetics for peripheral nerve block [13] or epidural analgesia [14] in patients undergoing gynecological operations [15], dental extraction [16], laparoscopic cholecystectomy [17], and foot surgeries [18].

The pathophysiological mechanisms for steroid effects may be related to the anti-inflammatory action, edema reduction, or shrinkage of connective tissue. Local steroid application was found to suppress transmission in thin unmyelinated C fibers [19].

It has been suggested that steroids may bind directly to the intracellular glucocorticoid receptor, and their effects are predominantly mediated through altered protein gene transcription [20]. The current study indicates that dexamethasone has no effect on the onset of akinesia in peribulbar block; this is because the action of dexamethasone starts after 1–2 h of its administration.

Also, our study showed that peribulbar block with dexamethasone led to significantly prolonged duration of akinesia with prolonged postoperative analgesia and time to first rescue analgesia. In support of the direct effect of dexamethasone, Shrestha et al. [21] found that dexamethasone added to local anesthetic prolongs postoperative analgesia significantly compared with tramadol when used as an admixture to a local anesthetic in brachial plexus block in upper extremity surgery, and Parrington et al. [22] also found that the addition of dexamethasone to mepivacaine prolongs the duration of analgesia but does not reduce the onset of sensory and motor blockade after ultrasound guided supraclavicular block compared with mepivacaine alone.

Furthermore, the analgesic efficacy of dexamethasone was found not to be related to the route of administration, this was supported by multiple studies that reported an analgesic effect after intravenous dexamethasone [23,24]. Others reported its analgesic effect after epidural administration [25].

Table 7 Postoperative nausea and vomiting.

	Group I $N = 23$	Group II $N = 25$
Nausea and vomiting $P > 0.05$ (=0.671)	1/23 Non-significant	3/25 Non-significant

Data are expressed as number percent. ($P > 0.05$) = non-significant.

Only one patient in the bupivacaine dexamethasone group experienced nausea and vomiting. The mechanism by which glucocorticoids alleviated nausea and vomiting is centrally mediated through inhibition of the release of endogenous opioids. Other suggested mechanisms include central or peripheral inhibition of the production or secretion of serotonin and change in permeability of the blood brain barrier to serum protein [26].

Some surgeons have some fears about steroids as it may mask the clinical signs of infection. However, since the biological half-life of dexamethasone is 36–58 h, it is normal for a postoperative wound to be re-dressed at 1 week, where by this time the corticosteroids would have been totally eliminated from the body [9].

Immediately after surgical incision, inflammatory, hormonal, immune and metabolic response are activated, so administration of steroids may decrease these responses by their anti-inflammatory and immunosuppressive effects by inhibiting cyclooxygenase enzyme and phospholipase A2 [27]. This was evident with the reduction of C-reactive protein levels in dexamethasone group than bupivacaine group alone.

5. Conclusion

From our study, we concluded that adding dexamethasone to bupivacaine as an adjuvant in peribulbar block provided more prolonged duration of akinesia and analgesia with reduced number of patients requiring analgesia and time to first analgesic rescue dose and reduced inflammatory response as well. Nevertheless, further studies are required before establishing dexamethasone as an adjuvant of choice for peribulbar block.

Disclaimers

None.

Conflicts of interest

None.

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