Original Article

Preemptive analgesia in elective cataract surgery (Phacoemulcification)

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ABSTRACT

Background: Preemptive analgesia is based on the idea that analgesia which initiates before a nociceptive even will be more effective than the analgesia commenced afterwards. This clinical trial compared postoperative analgesia and comfort in patients with general anesthesia combined with preoperative or postoperative local anesthesia.

Methods: 90 patients who had been scheduled for phacoemulcification in Farabi Eye Hospital, 2002-3, were enrolled in the study. Sixty patients received general anesthesia: 15 received preoperative local anesthesia (GA+LA+OP), 15 received post-operative local anesthesia (GA+OP+LA), and 30 did not get local anesthesia (only GA). Thirty patients only received local anesthesia (LA). Subjective postoperative pain was determined by a visual analogue scale. Frequency of oculocardiac reflex, postoperative nausea and vomiting (PONV), and patient's comfort were assessed.

Results: Postoperative pain was less in local anesthesia (LA) compared to general anesthesia (GA) ($p < 0.0001$). Additional preoperative application of local anesthesia (GA+LA+OP) resulted in less pain than additional postoperative application (GA+OP+LA) ($p <0.05$). Additional postoperative peribulbar block did not differ from general anesthesia (Only GA). The incidence of intraoperative oculocardiac reflex and postoperative nausea and vomiting was significantly less in patients with peribulbar block ($P = .0001$) and in GA+LA+OP group, as compared with others ($P= 0.001$).

Conclusion: We conclude that preoperative local anesthesia (Only LA) or in combination with general anesthesia provides the best comfort for the patient in eye surgery.

Keywords: preemptive analgesia, analgesia, peribulbar block, postoperative pain, phacoemulcification, ocular surgery

In the choice of anesthesia in eye surgery, the patient's age and general health condition, and the type of operation are more important than any other factors. General anesthesia is applied for infants or young children, mentally handicapped or non cooperative patients, patients with Alzheimer's or Parkinson's disease, asthmatics, for one eye surgeries, or when the operation takes a long time.

However, the advent of modern regional neural blocks and long acting local anesthetics have made the intravenous sedation together with local anesthesia the method of choice for most ocular surgeries. Despite many advantages of local anesthesia-like: less postoperative nausea/ vomiting, better hemodynamic stability, early patient mobilization and discharge, and longer postoperative analgesia-it still can be considered as the safest anesthetic method because the patients may open their eyes, cough or move under local anesthesia which can lead to temporary or permanent serious adverse outcomes.

A combination of general anesthesia and retrobulbar block has been recommended for vitreoretinal surgeries [4]. Also, the preemptive analgesia (Inhibition of noxious stimuli of surgery and control sensitization preoperatively in order to reduction of postoperative pain intensity, analgesic use, or both beyond the clinical duration of action of applied drug) by retrobulbar and peribulbar blocks have been used together with general anesthesia in children. Additionally, this method alleviates the oculocardiac reflex.

The superiority of local anesthesia over the general anesthesia is still controversial in the context of ocular surgery; as is the combinations of local and general anesthesia. The current clinical trial assessed the effectiveness of a combination of peribulbar-general anesthesia for anterior segment ocular surgeries regarding the patient's postanesthetic comfort and being whitout problems especially the oculocardiac reflex.

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Subjects and methods

This clinical trial involved 90 patients who took phacoemulcification in Farabi Eye Hospital, in 2002-3. The patients were of physical status 1 and 2, and had no background diseases. Exclusive criteria included: anesthesia physical status 3 and 4, elicit drug use, and any other drug(s) that could interfere with pain perception mechanisms or affect GI tract. They were randomly assigned to 4 groups and were anesthetized by 4 different techniques. Intraoperative oculocardiac reflex, postoperative patient's comfort, nausea and vomiting, and pain were evaluated in all the patients.

Premedication

Preoperatively, all the patients received Ringer 7ml/kg, followed by intravenous doses of lidocaine, 1 mg/kg, dexamethasone, 0.1 mg/kg, and fentanyl, 1.5 mic/kg. Atropine was not administered.

Anesthesia

The first group, that consisted of 30 patients, received general anesthesia with propofol, 2 mg/kg for induction, atracurium, 0.5mg/kg for intubation, and a maintenance propofol dose of 150 mic/ kg/ min. O_2 100% was administered and the patients were closely monitored.

The second group included 15 patients who received general anesthesia in the same way as the first group but in addition, received a peribulbar block before the beginning of operation (GA+LA+OP).

The 15 patients of the third group were anesthetized similar to group one but got a peribulbar block at the end of operation (GA+OP+LA).

In the fourth group, 30 patients received the premedication (see above) and thereafter a peribulbar block was conducted using 5 ml of lidocaine2%-bupivacaine 0.5% - Hyaluronidase.

In the first three groups, the effect of nondepolarizing muscle relaxant was reversed with prostigmine, 50 mic/ kg, and atropine, 25 mic/ kg. The respiratory competence was then checked and the patient was transferred to the recovery room.

Assessments

Cardiopulmonary monitoring was done by electrocardiogram, pulse oximeter, capnograph, and blood pressure. The frequency and duration of the oculocardiac reflex was recorded. Postoperative pain, and nausea/vomiting were recorded at 1, 6, 12, 18, and 24 postoperation hours. Postoperative pain was scored on a visual analogue scale (V.A.S.) of 0 to 10, with 0 as 'feeling no pain' and 10 as 'the worst pain ever experienced by the patients. Pain of 4-7 and 7 or worse was controlled with diluted fentanyl, 0.5 mic/ kg, and, 1 mic/ kg, respectively.

Postoperative nausea/vomiting was scored as 0-3; 0 for when there was no nausea/vomiting, 1 for nausea, 2 for vomiting, and 3 for repetitive nausea/vomiting. The patients, who scored 3, received intravenous metoclopramide, 10 mg.

Postoperative comfort was recorded at 24 hours based on the subjective patient's report on a yes/no scale.

The data were processed by SPSS 11.0, using ANOVA for quantitative variables, and non-parametric tests for qualitative ones.

Table 1. Age and gender frequencies (%) of the patients in each group (GA: general anesthesia, LA: local anesthesia, OP: operation, ASA:American society of Anesthesiologists, SD: standard deviation)

	GA	GA+OP+LA	GA+LA+OP	LA	Test	P-value
Female	12(40%)	7(46.6%)	8(53.5%)	14(46%)	X^2	> 0.05
Male	18(60%)	8(53.5%)	7(46.6%)	16(54%)	X^2	> 0.05
Age (yr)	60.7±15.7	60.27±14.1	62.07±12.07	59.3±15.5	ANOVA	> 0.05
Weight (kg)	68.73±8.06	71.07±8.3	69.53±6.42	67.83±8.6	ANOVA	> 0.05
Operation time (min)	29.97±3.37	48.53±1.73	48.07±2.02	40.1±3.37	ANOVA	> 0.05
ASA (I:II)	12:18	7:8	6:9	13:17	X^2	> 0.05
Mean opioid dose during surgery(mic)	86.2 ± 7.1	90.3 ± 6.3	85.5 ± 5.7	84.1 ± 3.9	ANOVA	> 0.05

Results

The patients aged 35-85 years old. The four study groups of our patients were similar in their mean age, age and sex distribution, and ASA physical class (Table 1). Fortunately, we came across no postanesthetic adverse effects. If the peribulbar anesthesia failed, the patient was excluded from the study and substituted.

The frequency and duration of the oculocardiac reflexes as are presented in Table 2.

The data of postanesthetic occurrence of nausea/vomiting are depicted in Table 3.

Postoperative nausea and vomiting was significantly lower in the groups receiving either local anesthesia (Only LA), or general anesthesia-preoperative local anesthesia (GA+LA+OP), as compared with those receiving general anesthesia (Only GA), or in combination with postoperative peribulbar block (GA+OP+LA) (Table 3). The former 2 groups required antiemetics less than the latter groups.

The mean intensity of postoperative pain and patient's comfort in the first 24 hours postanesthesia are presented in table 4. ANOVA analysis showed that VAS values were significantly lower in LA and GA+LA+OP than the other 2 groups (P<0.05). GA and GA+OP+LA groups were much the same.

Table 2. Frequency (%) and duration (mean±SD) of the oculocardiac reflexes in 4 groups of patients. (Non-parametric P-value was <0.05 indicating a statistically significant difference)

	GA	GA+OP+LA	GA+LA+OP	LA	Test	P-value
Frequency	20(66.6%)	9(60%)	2(13%)	5(16.6%)	X^2	< 0.05
Duration (seconds)	33.5±6.4	30.2±5.7	20.42±4.2	18.3±3.5	ANOVA	< 0.05

Table 3. Postoperative nausea and vomiting (PONV) in the 4 groups. (Non-parametric P-value was <0.05 indicating a statistically significant difference)

	GA	GA+OP+LA	GA+LA+OP	LA	Test	P-Value
No nausea (0)	11(36.6%)	7(46%)	10(66.6%)	21(70%)	X^2	< 0.05
With nausea (1)	10(33.3%)	4(26.6%)	3 (20%)	5(16%)	X^2	< 0.05
With vomiting (2)	7(23.3%)	3(20%)	2(13.3%)	3(10%)	X^2	< 0.05
Repetitive vomiting(3)	2 (6.6%)	1 (6.6%)	0	1 (3.3%)	X^2	< 0.05
PONV in 24 hours	19(63.3%)	8 (53.3%)	5(33.3%)	8 (53.3%)	X^2	< 0.05
Antiemetics administration in 24 hours	5(16%)	2(13.3%)	1(6.6%)	1(3.3%)	X^2	< 0.05

Table 4. Mean postoperative pain intensity (Based on VAS), and subjectively stated patient's comfort.

	GA	GA+OP+LA	GA+LA+OP	LA	Test	P-Value
Mean VAS hour 1 *	3.5±1.6	3.2±1.5	1±1.3	0.9±1.1	ANOVA	< 0.05
Mean VAS hour 6	3.8±2.8	4±2.7	1.5±2	1.1±1.8	ANOVA	< 0.05
Mean VAS hour 12	4.8±2.7	4.6±2.2	3.7±1.8	3.3±2.1	ANOVA	< 0.05
Mean VAS hour 18	4.6±2.5	4.3±2.9	3.4±1.9	3.7±2.3	ANOVA	< 0.05
Mean VAS hour 24	2.0±2	1.8±1.9	1.7±1.1	1.8±1.4	ANOVA	< 0.05
Patient's comfort	23(76.6%)	12(80%)	13(86.6%)	28(93.3%)	X^2	< 0.05

Discussion

Oculocardiac reflex is a common finding in the ocular surgeries under general anesthesia and can cause severe cardiac arrhythmias, especially bradyarrhythmias. It results from manipulation of the globe or traction of the extraocular muscles, and cannot be eliminated by general anesthesia.

In our study, 66.6% of the patients who received general anesthesia, and 60% of those who received general anesthesia-postoperative peribulbar block showed oculocardiac reflex for 33.5± 6.4 and 30.2±5.7 seconds, respectively. The incidence and duration of the oculocardaic reflex was significantly lower in patients receiving local anesthesia (Only LA), or peribulbar-general anesthesia (GA+LA+OP) than the other two groups (P-value<0.05). This can be due to the blockage of the efferent branch of the reflex.

Our results reproduced the findings of Wong, Esawy et al on the effectiveness of local anesthesia (with or without general anesthesia) in preventing the oculocardiac reflex [1, 2].

Also, preoperative retrobulbar anesthesia could reduce the postoperative nausea and vomiting by half. This finding could have been due to better postoperative analgesia, lower opioid administration, or attenuation of the oculoemetic reflex. Clinical evidences have shown that the afferent pathway of the reflex is common with the oculocardiac reflex (Allen et al, Esway et al) [1, 3].

Postoperative pain was noticeably less with local anesthesia (LA), and general anesthesia-preoperative local anesthesia (GA+LA+OP). The earlier postanesthetic analgesia can be attributed to the half life and peak effect of the local anesthetics. However, experiencing less pain thereafter implies the 'preemptive analgesic' effect of the local anesthetics administered preoperatively.

Preemptive analgesia results from early blockage of nociceptive pathways, just before the surgical trauma. It is believed that painful stimuli (like surgical trauma) affect the function of some central nociceptive neurons that is known as 'central sensitization'. The 'central sensitization' directly affects the perception and intensity of pain. Early blockage of the nociceptive pathways prevents

central sensitization, which is called 'preemptive analgesia' [4, 5, 6]. Preemptive analgesia has been widely applied in tonsillectomy, orthopedic surgeries, obstetric surgeries and cesarean section, and abdominal surgeries[7, 8,9,10].

There is a controversy over the efficacy of preemptive analgesia in ocular surgeries. Ates et al, in a study on children who have undergone strabismus surgery, did not find any significant difference between the postoperative pain and need for analgesics in patients receiving general anesthesia with or without preoperative local anesthesia [11].

Maberley et al demonstrated that ocular surgeries under local anesthesia caused more postoperative pain than when they were performed under general anesthesia [12]. However, Barker et al stated that local and general anesthesias did not differ much in the incidence of postoperative pain and need for analgesics [13].

Our findings in the current clinical trial are comparable to those of Esawy et al on beneficial effects of preemptive analgesia in controlling postoperative pain from ocular surgeries [1]. Moreover, many other studies have shown the perioperative advantages of preemptive analgesia [14, 15, 16, 17, 18].

It must be noted that local analgesia carries a certain risk of adverse effects such as seizures, loss of consciousness, cardiopulmonary arrest, retrobulbar hemorrhage, and perforation of the globe. However, these complications don't occure commonly, and with the peribulbar block, which was used in the current study, they are even rarer.

In general, we conclude that the preoperative local anesthesia by peribulbar block or in combination with general anesthesia is superior to general anesthesia in regard with certain factors such as postoperative analgesia, patient's comfort, and safety.

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