PREOPERATIVE SUB-TENON BLOCK DECREASES PERIOPERATIVE PAIN SEVERITY AND ADVERSE COMPLICATIONS

MOHAMMAD R. SAFAVI*
OMID AGHADAVOUDI*
HASSANALI SOLTANI*
SAYED-JALAL HASHEMI*
ALIREZA DEHGHANI**
HOSSEIN MAHJOBI*
LEILA LOGHMANIAN**

SUMMARY : This study was designed to evaluate the efficacy of sub-tenon block (preemptive analgesia) after general anesthesia and before beginning the repair of retinal detachment (RD) surgery by using scleral buckle and cryopexy.

Sixty eight patients scheduled for RD surgical repair with "American Society of Anesthesiologists" (ASA) I or II were included in this clinical trial study. The patients were randomly and blindly divided into two equal groups. The surgery was done under general anesthesia in both groups, but in the case group, sub-tenon block was given as preemptive analgesia after the induction of general anesthesia with similar methods and before the start of surgery.

The incidences of intra and postoperative (up to 24 hours) oculocardiac reflex (OCR), ischemic heart disease (IHD) changes, nausea and vomiting (PONV), delirium, total analgesic drug consumption and ocular severity of pain were significantly lower in the case group compared with the control group ($p<0.05$). Mean blood pressure, heart rate, time of discharge from the hospital, frequency of requirement to analgesic drug, intra and postoperatively were significantly lower in the case group compared with the control group ($p<0.05$).

According to this research, the use of sub-tenon block in RD surgery effectively reduces PONV, postoperative pain, analgesic drug requirements, delirium, discharge time from the hospital, IHD, hemodynamic changes and OCR, therefore it is recommended for daily routine ophthalmologic surgeries.

Key Words: Sub-tenon block, preemptive analgesia, postoperative pain, oculocardiac reflex (OCR), postoperative nausea and vomiting (PONV), retinal detachment (RD).

INTRODUCTION

Control of postoperative pain and reduction of complications in the perioperative period such as postoperative nausea and vomiting (PONV) and cardiac dysrhythmias are frequently encountered by anesthesiologists. One recommended to reduce postoperative pain is using preemptive analgesia (1).

Preemptive analgesia may be defined as an antinociceptive treatment that prevents establishment of altered central processing of afferent input from sites of injury. The most important conditions for establishment of effective preemptive analgesia are the establishment of an effective level of antinociception before operative injury and contin-

*From Department of Anesthesiology, Faculty of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran.
** From Department of Ophthalmology, Faculty of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran.

Table 1 : Perioperative hemodynamic variables in the two study groups.

Hemodynamics variables	Case group	Control group	p- value
SBP-0(mmHg)	126.6 ± 16.1*	124.9 ± 8.8	0.28
SBP-io(mmHg)	103.3 ± 11.9	125.9 ± 7.2	0.0001
SBP-r(mmHg)	108 ± 6.4	129 ± 8.4	0.0001
SBP-w(mmHg)	126.4 ± 7.4	134.6 ± 5.5	0.01
DBP-0(mmHg)	76.8 ± 7.2	75.2 ± 11.6	0.59
DBP-io(mmHg)	69.6 ± 8.7	74.8 ± 5.8	0.01
DBP-r(mmHg)	72.6 ± 5.6	79.7 ± 7.4	0.01
DBP-w(mmHg)	76.4 ± 6.4	74.4 ± 6.8	0.1
HR-0(beat/min)	87.5 ± 10.6	88.2 ± 7.3	0.65
HR-io(beat/min)	72.6 ± 6.3	86.4 ± 4.6	0.001
HR-r(beat/min)	76.7 ± 3.7	90.4 ± 4.9	0.0001
HR-w(beat/min)	82.8 ± 3.4	88.2 ± 6.5	0.02

SBP: Systolic Blood Pressure, 0: Preoperative, DBP: Diastolic Blood Pressure, io: mean intra-operative, HR: Heart Rate, r: recovery, w: ward *Data are presented as mean ± standard deviation. T-Test is used for statistical comparing between the two groups.

uation of this effective analgesic level well into the post operative period to prevent central sensitization during the inflammatory phase. Although single-agent therapy may attenuate the central nociceptive processing, multi-modal therapy is more effective and may be associated with fewer side effects compared with the high-dose, single-agent therapy (2). Clinically, this strategy predicts not only less pain during the initial postoperative period but also lowers the intensity of pain during the days after the procedure by lessening pain during recovery. Fewer analgesics are consumed which results in reduction of adverse drug reactions complicating the postoperative course and less delay in patient's return to normal activities. The patient can be assured that the postoperative pain associated with the procedure will be minimized, thereby decreasing postoperative apprehension, increasing patient motivation for enduring the procedure and enhancing the probability of a smooth postoperative course (3). The goal in pain management is to inhibit destructive pain pathways, maintain intraoperative analgesia and prevent central sensitization (4). The postoperative period is associated with increased production of proinflammatory cytokines which are known to augment pain sensitivity among other effects. Proinflammatory cytokines are key mediators of illness symptoms, including hyperalgesia. The results presented here suggest that preemptive analgesia is associated with reduced postoperative pain and attenuated production of proinflammatory cytokines (5, 6). The reliability of preemptive analgesia is, however, controversial. Its effectiveness may vary among anatomical areas or surgical types. Morphine epidural preemptive analgesia is reliably effective in limb and breast surgeries but uneffective in abdominal surgery suggesting involvement of the brain stem and cervical spinal cord via the vagus and phrenic nerves. Therefore supraspinal and or cervical spinal neurons might be sensitized, despite the blockade of the segmental nerves with epidural morphine (7). Peripheral nerve blocks are used as part of a preemptive analgesia and multimodal analgesia technique to provide safe and effective postoperative pain management with minimal side effects. They are used for a variety of surgical procedures in both inpatient and outpatient settings. Peripheral nerve blocks have resulted in shorter recovery times, decreased anesthesia related complications, better postoperative pain management and lessening side effects such as PONV (8). Up to 80% of patients report moderate to severe pain after craniotomy. Ropivacaine scalp block decreases the severity of pain after supratentorial craniotomy (9). Intraoperative bupivacaine infiltrated locally into surgical wounds is associated with both a decreased need for postoperative parenteral narcotics and a reduced number of doses in patients who have undergone a laparoscopic appendectomy (10). Presurgical axilliary block with 0.125% bupivacaine allows the use of inhalational anesthetics at lower concentrations while providing a reasonably painless postoperative period (11). In the case of ocular surgery, there are no complete researches about the effectiveness of the peripheral nerve block in the postoperative pain management. In one study because there was no significant difference in the terms of postoperative analgesia in the retrobulbar block or subconjunctival local anesthesia infiltration group compared with the control group, conventional methods of pain treatment are suggested to be adequate for postoperative analgesia in the strabismus and the retinal detachment surgery (13). In another study, after ocular nerve block, the incidence of

Table 2 : Postoperative pain severity in the two study groups.

Time	Recovery		6-hours		12-hours		24-hours	
Groups	Case	Control	Case	Control	Case	Control	Case	Control
No pain	32*	0	77	0	22	50	22	52
Mild pain	68	5	18	5	0	43	0	42
Moderate pain	0	28	5	38	0	52	0	0
Severe pain	0	67	0	57	0	0	0	0
P-value**	0.001		0.001		0.001		0.001	

Mild pain: VAS=0-3, Moderate pain: VAS= 4-7, Severe pain: VAS=8-10, *Data are presented as relative frequency,
** Mann- Withney test.

intraoperative oculocardiac reflex (OCR), PONV and doses of opioid drugs administered during 24 hours post-operatively, were all decreased (12). According to previous investigations, the effectiveness of preoperative ocular nerve block on pain severity and complications, intra and postoperatively is infrequently studied and the reliability of nerve block is controversial. Therefore, we designed a clinical trial study to evaluate the effects of preoperative ocular sub-tenon block in the repair of retinal detachment surgery on the severity of pain and the complications of perioperative period.

MATERIALS AND METHODS

After approval of this study by the local research department and getting informed consent, 68 adult patients were scheduled for elective repair of retinal detachment surgery using scleral buckle and cryopexy under general anesthesia. The patients had physical status classification of ASA I or II. They were randomly divided into two equal groups (i.e. 34 in each group). The surgery was done under general anesthesia with a similar method in both groups. Induction of anesthesia was done after preoxygenation (10 liter flow during 2 min + Spo_2>95%), by administering intravenous fentanyle 2mcg/kg/iv, thiopental 5mg/kg/iv, atracurium 0.5 mg/kg/iv. In the case group, sub-tenon block was done with injecting 4 cc bupivacaine 0.5% into subtenon space by the ophthalmol-

Table 3 : Perioperative adverse complications and analgesic parameters in the two study groups.

Variables	Case group	Control group	P- value	Test
PONV-r	0.5 ± 0.2*	2.4 ± 0.3	0.0001	Mann-Whitney
PONV-w	0.4 ± 0.2*	3.4 ± 0.5	0.0001	Mann-Whitney
OCR-io	0.14 ± 0.11*	2.24 ± 0.76	0.0001	Mann-Whitney
OCR-r	0.01 ± 0.01*	0.33 ± 0.15	0.0001	Mann-Whitney
Delirium-r	3.7%**	24.1%	0.0001	Chi- Square
Delirium-w	2.2%**	8.2%	0.0001	Chi- Square
Ischemic ECG	2.9%**	14.7%	0.01	Chi- Square
Analgesic use-r	0.05 ± 0.03*	1.23 ± 0.3	0.0001	Mann-Whitney
Analgesic use-w	0.04 ± 0.04*	2.14 ± 0.26	0.0001	Mann-Whitney
Analgesic dose-r	0.4 ± 0.1***	2.4 ± 0.8	0.0001	T- Test
Analgesic dose-w	0.5 ± 0.2***	2.1 ± 0.6	0.0001	T- Test

PONV: Post Operative Nausea and Vomiting, OCR: Oculo-Cardiac Reflex, ECG: Electrocardiogram
io: mean intra-operative, r: recovery, w: ward
*Data are presented as mean frequency of happening ± standard deviation.
** Data are presented as relative frequency
*** Data are presented as milligram of morphine

ogist after induction of anesthesia. The control group did not receive any preemptive block. Anesthesia was maintained with O_2/N_20 each one of 50% and Halothane with inspiratory concentration of 0.5-1%. The patients in both groups were evaluated intraoperatively considering blood pressure and heart rate (each 10 minutes up to end of the recovery and then at 6, 12 and 24 hours postoperatively), OCR, PONV, delirium, ECG changes (at 6 hours postoperatively), ocular severity of pain according to visual analogous scale (VAS) (mild pain: VAS=0-3, moderate pain: VAS=4-7, severe pain: VAS=8-10) and frequency of the analgesic drug requirements up to 24 hours, postoperatively. Statistical analysis was performed using SPSS version 11 software and selecting t-student, Chi-square, Mann-whitney, Wilcoxon and Fisher tests. P value of less than 0.05 was considered statistically significant. The data are presented as Mean ± Standard deviation.

RESULTS

A total of 68 patients (34 female and 34 male) were involved in this study. Both groups were statistically comparable according to their age, weight and duration of anesthesia and surgery. Mean age in the case group was 44±20 years and in the control group 46±17 years, (p> 0.05). Preoperative systolic blood pressure, diastolic blood pressure, heart rate (before sub-tenon block) were not significantly different between the case group and the control group (Table 1, $p > 0.05$). The later observations (after sub-tenon block, each 10 minutes, up to the end of the recovery and each 6 hours, up to 24 hours), the hemodynamic parameters were significantly different between the two groups (Table 1, $p < 0.05$). The incidence of PONV up to 24 hours were significantly lower in the case group (41.2%) compared with the control group (73.5%, $p < 0.0001$). According to VAS score, the incidences of postoperative ocular severity of pain, up to 24 hours, were significantly lower in the case group compared with the control group (Table 2, $p < 0.001$). The incidences of intra and postoperative OCR were significantly lower in the case group (14.7%) compared with the control group (52.9%, Table 3, $p < 0.001$). The incidence of postoperative delirium was significantly lower in the case group (5.9%) compared with the control group (32.3%, Table 3, $p < 0.001$). The incidences of intra and postoperative IHD changes up to 24 hours were significantly lower in the case group (2.9%) compared with the control group (14.7%, Table 3, $p < 0.01$). The mean duration of discharge time from the hospital was significantly shorter in the case group (26±1.5 hours) compared with the control group (34±3.5 hours, $p < 0.01$). The total analgesic consumption up to 24 hours postoperatively was significantly lower in the case group compared with the control group (Table 3, $p < 0.0001$). The mean time to first dose analgesic, postoperatively was significantly shorter in the control group (40±8.5 minutes) compared with the case group (84±10 minutes, $p < 0.001$). The mean frequency requirement to analgesic drugs up to 24 hours postoperatively was significantly lower in the case group (recovery: 0.05±0.03 times, post recovery up to 24 hours: 0.04±0.04 times) compared with the control group (recovery: 1.2±0.3 times, post recovery up to 24 hours: 2.1±0.26 times) ($p< 0.001$).

DISCUSSION

According to these results of this study use of sub-tenon block as preemptive analgesia after the induction of general anesthesia and at the beginning of the RD surgery is effective in reducing PONV, postoperative pain, analgesic requirements, delirium, discharge time from the hospital, IHD, OCR and hemodynamic changes compared with the control group.

According to the most important variable in this study that is ocular severity of pain after operation, it is obvious that the case group has lower mean severity of pain and therefore decreased need to analgesic drugs both in recovery and ward. Mahfouz and Nabawi (12) showed that sub-tenon block caused reduction of pain and need to narcotics but Ates et al. (13) revealed that retrobulbar block or subconjunctival infiltration by bupivacaine before strabismus surgery did not have any effect on postoperative pain reduction and also caused increased PONV. According to Aida and colleagues' study (7), preemptive analgesia method in operative limbs and mastectomy was effective but was not effective in abdominal operations (i.e. gasterectomy, appendectomy and hysterectomy). Authors concluded that these results are due to innervation of the abdominal viscera by vagus and phrenic nerves. According to our findings the patients' hemodynamic parameters in the sub-tenon block group had smaller changes in perioperative period and this means reduction of response to input into CNS and decreased activity of the sympathetic nervous system. These results especially in patients with history of hypertension and IHD are very important. Surgeries, using this technique is recommended. Our result revealed that sub-tenon block in our patients reduced

PONV during recovery and later in the ward. In addition, reducing the incidence of intraoperative OCR is another usefulness of this method. Also, postoperative delirium in this method was decreased perhaps because postoperative pain was lower and patients were more comfortable. As a whole, according to the current results, we recommend ocular sub-tenon block after induction of anesthesia and at the beginning of the ocular surgery. But some authors have observed that preemptive anesthesia with preoperative nerve block is uneffective. This could be due to some technical reasons such as insufficient level of anesthesia secondary to inadequate density of block (14). Therefore, use of preemptive analgesia for ocular surgery especially for repair of RD is recommended. It is also suggested that the effects of this method in other ocular operations for example deep vitrectomy and cataract surgery needs to be evaluated. Therefore it appears that sub-tenon block may be of value in many other operations outside of the field of ophthalmic surgery.

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Correspondence:
Mohammad Reza Safavi,
Ophthalmology Feize Medical Center,
Isfahan, IRAN.
e-mail: drmsafavi@yahoo.com