THE USE OF SUB-TENON BLOCK AS PREEMPTIVE ANALGESIA TO IMPROVE PERIOPERATIVE ADVERSE EFFECTS FOR RETINAL DETACHMENT SURGERY

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ABSTRACT

Background and objectives: To study the efficacy of sub-Tenon block in reducing the intensity of pain and reduction of perioperative adverse effects that occur during retinal detachment repair surgery under general anesthesia.

Materials and methods: Sixty, 60 ASA physical status I or II patients undergoing retinal detachment repair surgery were randomized into two groups, both groups received general anesthesia either with sub-Tenon block (using 2 ml lidocain 2% and 2 ml bupivacaine 0.5%) in the case group or without sub-Tenon block in the control group. Intraoperative hemodynamic changes, intraoperative complications and ocular tension monitoring were recorded. Postoperative intensity of pain were assessed by visual analogous score (VAS). Also, occurrence of postoperative nausea and vomiting (PONV) were recorded.

Result: As regard post operative pain, in group 1 (with sub-Tenon injection) early in the recovery, visual analogous score was less than in group 2 (without sub-Tenon injection), also the proportion of patient with no
pain was higher in group 1 vs group 2 (56.7% vs 36.7%). Visual anan-
gous score at 3 hours post operative 
was lower in group 1 vs group 2 and 
the proportion of patient with no pain 
was more (53.3% in group 1 vs 23.3% group 2). Occurrence of ocu-
locardiac reflex was less in group 1 
than in group 2 (30.0% vs 60.0%), 
also occurrence of postoperative 
nausea and vomiting in early post 
operative period was less in the 
group 1 than the group 2 (30.0 vs 
60.0).

Conclusion: The use of sub-
Tenon block as a preemptive anal-
gesia for retinal detachment repair 
surgery may be safe and effective in 
reducing the intensity of pain in 
the early post operative period. 
Decrease the incidence of oculocardiac reflex and postoperative nausea and vomiting is another important benefit.

INTRODUCTION

Postoperative pain is one of the 
major problems in the surgical servic-
es (Akkaya and Ozkan). Previous 
study from (Henzler et al) in patient 
underwent various eye surgeries 
Vol. 40, No. 1 & 2 Jan., & April, 2009 showed that posterior segment sur-
gery was more painful compared to 
the anterior segment.

Efficacy of preoperative ocular 
nerve block on pain severity and com-
lications that occur intra and post 
operatively are frequently encoun-
tered by the anesthesiologist. One 
recommendation to reduce postoper-
ative pain is using preemptive analge-
sia (Kelly et al) which defined as an-
tinociceptive treatment that prevents 
establishment of altered central pro-
cessing of afferent in put from sites of 
injury. Drugs that stabilize the mem-
brane (e.g local anesthesia) can pre-
vent the formation of action potential 
of the pain pathway (Kelly et al).

Previous studies showed that the 
efficacy and safety of a sub-Tenon's 
approach to local anesthesia in the 
anterior segment. Several investiga-
tors have demonstrated that the sub-
Tenon's capsule block can provide 
safe and effective local anesthesia for 
vitreoretinal procedures (Patton et al). 
However, the efficacy of a sub-
Tenon's capsule injection in posterior 
segment surgery is less well estab-
lished.
Sub-Tenon's anesthesia acts on the short ciliary nerve, and causes sensory and motor blocks by directly operating on the extraocular muscles' oculomotor nerves (Kumar).

Clinical studies have been performed to know the efficacy of using local anesthetic agents in retinal detachment repair surgery. In one study after ocular nerve block, the incidence of intraoperative oculocardiac reflex, postoperative nausea and vomiting and doses of analgesia given during 24 hours, postoperatively were all decreased (Mahfouz and Nabawi).

Novel study from (Barakat) and (Lai et al) did not show any benefit of local anesthesia in vitreoretinal surgery.

According to previous studies, the effectiveness of preoperative ocular nerve block on pain severity and complications is infrequently studied and the reliability of nerve block is controversial.

This study evaluates the efficacy of preoperative sub-Tenon block using a combination of lidocain and bupivacaine as preemptive analgesia in the repair of retinal detachment.

**MATERIALS**

After getting informed consent and ethical committee approval, sixty patients were scheduled for elective repair of retinal detachment surgery under general anesthesia. The patients had physical status I or II of ASA classification.

Inclusion criteria were, patients underwent retinal detachment repair with scleral buckling, age above 18 years old, there were no history of anaphylaxis with local anesthetic and patients were willing to participate in the study. Exclusion criteria were verbal or visual disturbance to VAS interpretation, patient's undertaken beta-blockers and patients with history of postoperative nausea and vomiting after previous anesthesia.

Patients were prospectively randomly divided into two groups (30 patients in each group), randomization were done using the closed enve-
lope method, the envelope opened by a nurse not engaged in the study. Both group received general anesthesia. One group (group 1) received the combination of (2ml of 2% lidocain and 2ml of 0.5% bupivacain) through sub-Tenon injection before the start of general anesthesia.

Basal values of systolic blood pressure, diastolic blood pressure, oxygen saturation were recorded preoperatively.

Administration of sub-Tenon local injection was conducted by the ophthalmologist through initially creating incision of the conjunctiva and Tenon capsule along the 2mm length starting approximately 6mm from the limbus in the inferotemporal quadrant, blunt cannula was inserted into the retrobulbar space and local anesthetic was injected. The other group (group 2) receive only general anesthesia, both group received general anesthesia with similar method. Induction was done after preoxygenation (with 10 liter flow for 2min with (spo2>95%). Intravenous fentanyl 1µg/kg, thiopental 5mg/kg and tracheal intubation was facilitated by using atracurium 0.5mg/kg Anesthesia was maintained with O2 only and isoflurane with inspiratory concentration of 1.2%, evaluation of patients was done intraoperatively considering blood pressure (systolic and diastolic blood pressure), heart rate (each 10 minute up to the end of surgery, during the recovery room and in the ward) and occurrence of Oculocardiac Reflex (it was defined as 20% decrease in the heart rate due to muscle - twitch of ocular muscle).

Postoperative monitoring of the severity of ocular pain according to visual analogus scale (VAS), mild pain with VAS=0-3, moderate pain with VAS =4-7 and severe pain with VAS =8-10.

Postoperative complications such as postoperative nausea and vomiting (PONV) and E.C.G changes were recorded. Also postoperative analgesic (in the form of nonsteroidal anti-inflammatory agent) requirement by the patient were recorded. No prophylactic antiemetic or antimuscarinic agents were given.
STATISTICAL ANALYSIS

The statistical analysis of data done by using excel program and statistical package for social science version 10 (SPSS). To test the normality of data distribution Kolmogorov-Smirnov (K-S) test was done only significant data revealed to be nonparametric.

All tested data revealed to be parametric. The description of the data done in form of mean (+/-) SD for quantitative data.

The analysis of the data was done to test statistical significant difference between groups. For quantitative data student t-test was used to compare between two groups. Paired sample t-test to compare one group at different time. Chi square test was used for qualitative data.

P is significant if < or = 0.05 at confidence interval 95%.

RESULTS

Data were obtained from 60 patients (40 male & 20 female) aged from (20-78 years) who underwent retinal detachment repair surgery with scleral buckle. Both groups underwent the same perioperative procedure, except the subtenon injection before general anesthesia in group 1. The duration of surgical procedure was not statistically significant. The average ocular tension after subtenon injection of local anesthetic was slightly higher in group 1 but it was of no importance (table 1).

Perioperative hemodynamic changes (systolic blood pressure, diastolic blood pressure and heart rate) were not statistically significant (table 2).

Intraoperative monitoring of oxygen saturation and end-tidal CO2 were not statistically significant.

Proportion of patients who were pain-free at recovery between group 1 and group 2 showed (56.7% vs 36.7%), also 3 hours postoperative (53.3% vs 23.3%). VAS was significantly lower in group 1 vs group 2) both at recovery and 3h postoperative, two patients in group 1 vs seven patients in group 2 who need additional analgesia (table 3).

Statistical analysis of severity of pain at 6h, 12h, 24 h, postoperative
showed that there were no significant difference between both groups (table 3).

Statistical analysis of occurrence of perioperative complications showed that there were significant differences between group 1 and group 2 as regard the proportion of occurrence of oculocardiac reflex (30.0% vs 60.0%) (table 4).

Also postoperative nausea and vomiting at recovery showed that the proportion of cases with PONV in the group 1 were less than that of the group 2 (30.0% vs 60.0%) (table 4).

**TABLE (1): Demographic characteristic Data**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1 (N=30)</th>
<th>Group 2 (N=30)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>21 (70.0%)</td>
<td>19 (63.3%)</td>
<td>0.58</td>
</tr>
<tr>
<td>Female</td>
<td>9 (30.0%)</td>
<td>11 (36.7%)</td>
<td></td>
</tr>
<tr>
<td>Age(year)</td>
<td>40–65</td>
<td>38–60</td>
<td>0.23</td>
</tr>
<tr>
<td>Duration of surgery (In min)</td>
<td>105.6±9.8</td>
<td>103.3±7.5</td>
<td>0.30</td>
</tr>
<tr>
<td>Ocular tension (mmhg)(pre surgery after subtenon)</td>
<td>12.0.±.83</td>
<td>11.4±.96</td>
<td>0.005 *</td>
</tr>
</tbody>
</table>

Values were given as mean ± SD except for sex data were presented as relative frequency.

No significant differences
Increase ocular tension in group 1.
<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
<th>P- value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Haemodynamic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>changes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBP - basal</td>
<td>141.6 ± 11.0</td>
<td>140.3 ± 10.0</td>
<td>0.64</td>
</tr>
<tr>
<td>SBP- (every 10 min )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>intraoperative</td>
<td>121.7 ± 7.9</td>
<td>115.3 ± 6.6</td>
<td>0.001**</td>
</tr>
<tr>
<td>SBP - recovery</td>
<td>129.5 ± 13.3</td>
<td>130.7 ± 8.2</td>
<td>0.68</td>
</tr>
<tr>
<td>SBP - ward</td>
<td>125.3 ± 12.5</td>
<td>122.6 ± 13.2</td>
<td>0.41</td>
</tr>
<tr>
<td>DBP-basal</td>
<td>92.1 ± 6.1</td>
<td>89.4 ± 6.1</td>
<td>0.08</td>
</tr>
<tr>
<td>DBP-(every 10 min )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>intraoperative</td>
<td>73.04 ± 8.1</td>
<td>72.3 ± 10.1</td>
<td>0.778</td>
</tr>
<tr>
<td>DBP- recovery</td>
<td>73.9 ± 21.1</td>
<td>78.3 ± 24.1</td>
<td>0.459</td>
</tr>
<tr>
<td>DBP-ward</td>
<td>74.9 ± 14.9</td>
<td>77.8 ± 12.9</td>
<td>0.43</td>
</tr>
<tr>
<td>HR-basal</td>
<td>83.1 ± 12.1</td>
<td>82.9 ± 12.2</td>
<td>0.95</td>
</tr>
<tr>
<td>HR-intraoperative</td>
<td>85.3 ± 6.3</td>
<td>84.9 ± 6.4</td>
<td>0.81</td>
</tr>
<tr>
<td>HR-recovery</td>
<td>99.2 ± 10.3</td>
<td>98.8 ± 10.9</td>
<td>0.89</td>
</tr>
<tr>
<td>HR-ward</td>
<td>79.7 ± 7.1</td>
<td>80.3 ± 6.1</td>
<td>0.72</td>
</tr>
</tbody>
</table>

No significant differences between both groups.

Values were given as mean ± SD.

SBP= systolic blood pressure(mmHg).

DBP= diastolic blood pressure(mmHg).

HR= heart rate(beat /min).

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### TABLE (3): Post operative severity of pain.

<table>
<thead>
<tr>
<th>Time</th>
<th>recovery</th>
<th>3h</th>
<th>6h</th>
<th>12h</th>
<th>24h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group 1</td>
<td>Group 2</td>
<td>Group 1</td>
<td>Group 2</td>
<td>Group 1</td>
</tr>
<tr>
<td></td>
<td>(n=30)</td>
<td>(n=30)</td>
<td>(n=30)</td>
<td>(n=30)</td>
<td>(n=30)</td>
</tr>
<tr>
<td>VAS</td>
<td>2.8423±1.41</td>
<td>5.4713±3.4</td>
<td>0.016*</td>
<td>2.0681±1.61</td>
<td>3.6681±1.83</td>
</tr>
<tr>
<td>No</td>
<td>17(56.7%)</td>
<td>11(36.7%)</td>
<td></td>
<td>16(53.3%)</td>
<td>7(34.3%)</td>
</tr>
<tr>
<td>mild()</td>
<td>9(30.0%)</td>
<td>7(23.3%)</td>
<td></td>
<td>12(40.0%)</td>
<td>8(34.7%)</td>
</tr>
<tr>
<td>Moderate (+++)</td>
<td>2(6.7%)</td>
<td>1(3.3%)</td>
<td></td>
<td>2(6.7%)</td>
<td>15(50.0%)</td>
</tr>
<tr>
<td>Severe (+++)</td>
<td>2(6.7%)</td>
<td>7(23.3%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VAS (visual analogue score).**

*significant difference between both groups*
TABLE (4) : Perioperative complications.

<table>
<thead>
<tr>
<th>variable</th>
<th>Group 1 (n=30)</th>
<th>Group 2 (N=30)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCR</td>
<td>9(30.0%)</td>
<td>18(60.0%)</td>
<td>0.020 *</td>
</tr>
<tr>
<td>PONV-recovery</td>
<td>9(30.0%)</td>
<td>18(60.0%)</td>
<td>0.020*</td>
</tr>
<tr>
<td>PONV-ward</td>
<td>5(16.7%)</td>
<td>10(33.3%)</td>
<td>0.136</td>
</tr>
<tr>
<td>With sleep disturbance</td>
<td>19(63.3%)</td>
<td>18(60.0%)</td>
<td>0.893</td>
</tr>
</tbody>
</table>

OCR = oculocardiac reflex.

PONV = post operative nausea and vomiting.

Data are presented as relative frequency.

* significant reduction of proportion of patient without occurrence of OCR and PONV in the case group.
DISCUSSION

This study showed that the proportion of patient with no pain in group 1 was more than that of group 2 (56.7% vs 36.7%) at the recovery period, and also 3 hours post operative (53.3% vs 23.3%) this may indicate the success of analgesic effect of local subtenon in group 1.

According to (Safavi et al), study the incidences of post operative ocular severity of pain, up to 24 hours, were significantly lower in the case group compared with the control group.

(Aatifudin et al), showed that the mean VAS and the proportion of pain free patients between the two groups were similar.

(Kristin et al), showed that the average value of VAS in the case group was 1.00 while that of the control group was 3.00, their study showed that the proportion of pain free patients was 65% 3 hours post-operative. Similar research by (Clarke et al), showed that a number of success range between (56% - 72% cases), while proportion of patients who were pain free in both groups were similar (65% vs 65%).

Systemic study from (Ong et al), showed that the results for preemptive analgesia in many cases were still variable. (Mason et al), showed that the addition of local block did not affect the measurement of pain incidence, also (Bahcecioğlu et al), showed that the local anesthesia did not provide additional benefits in the vitreoretinal operation. Some authors have observed that preemptive anesthesia with preoperative nerve block is insufficient this may be due to, less adequate afferent block, pain intensity and type of operation, inflammatory mediators and the individual reaction post-operative.

Controversial result was obtained from (Guise), who showed that the sub-Tenon block was very effective.

(Calenda et al), showed that the average VAS in sub-Tenon group was lower than that of the control group.

The result of this revealed that
sub-Tenon block decrease the PONV during the recovery and later in the ward also significant reduction of the occurrence of intraoperative OCR which was very useful result in this research, also there was decrease postoperative analgesia given in group 1.

Similar research by (Safavi et al) which revealed that sub-Tenon block reduced PONV and occurrence of intraoperative OCR.

As a whole, according to this study, sub-Tenon block as a preemptive analgesia for retinal detachment repair surgery was safe and effective in reducing pain intensity at early postoperative period and also decrease the incidence of intraoperative complication and postoperative nausea and vomiting.

**CONCLUSION**

1-This study showed that sub-Tenon block reduce the intensity of ocular pain in retinal detachment repair surgery
2-Reduction of PONV during recovery.
3-In addition, reducing the incidence of occurrence of intraoperative OCR is another usefulness of this block

**REFERENCES**

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