

Comparison between Remifentanyl, Propofol or Both for Sedation During Retrobulbar Nerve Block

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Abstract

Objectives: To compare between the efficacy of remifentanyl and propofol and combination of both for analgesia during retrobulbar nerve block in cataract surgery.

Materials and Methods: A prospective randomised double blind study conducted in King Hussein Medical Center in Royal Medical Services during the period between September 2004 and August 2005. 160 patients undergoing extra capsular cataract extraction surgery under retrobulbar anaesthesia were enrolled in the study. Patients were randomly divided into four groups (40 patients in each group) and received different drug combinations by the same anaesthetist as follows: remifentanyl 0.3 microgram/kg (group 1), propofol 0.5 mg/kg (group 2), remifentanyl 0.3 microgram/kg and propofol 0.5 mg/kg (group 3) and saline 0.1 ml/kg as a placebo (group 4). Patient's movement and pain were observed during the injection. Heart rate, respiratory rate and haemoglobin oxygen saturation were observed every minute for 10 minutes after the block.

Results: No significant movement occurred in group 3 during the placement of the block compared to half of the patients in the control group. The mean visual analogue score was 2.3 in group 3 compared to 6.7 in group 4. There was no significant change in mean heart and respiratory rates and haemoglobin oxygen saturation among the three study groups.

Conclusion: Patients undergoing cataract surgery under retrobulbar anaesthesia, a combination of remifentanyl 0.3 microgram/kg and propofol 0.5 mg/kg is considered to provide excellent relief of pain with least patient movement and minimal respiratory and cardiac side effects.

Keywords: Retrobulbar, remifentanyl, propofol, analgesia.

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Introduction

The setting of retrobulbar anaesthesia is the most important single preoperative stress factor in ophthalmic surgery under regional anaesthesia,

which induces a more prominent increase in plasma catecholamines than the operation itself.¹ This results in anxiety, tachycardia and hypertension which may produce considerable morbidity and mortality.^{2,3}

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Furthermore, movements during the injection can lead to complications such as inadequate block, retrobulbar haemorrhage or cardiopulmonary arrest.^{4, 5} Therefore, concomitant medication for analgesia and comfort is desirable to provide analgesia and sedation during the injection. The provision of effective analgesia and sedation for patients is important in controlling pain, relieving agitation and anxiety, and thereby maintaining patient's comfort.⁶

Various drugs alone or in combination have been used to provide sedation during ophthalmic nerve blocks.^{7, 8} Agents such as propofol, remifentanil and midazolam are commonly used for sedation because of their effectiveness and relatively short elimination half-lives.⁹ Propofol, an alkylphenol derivative, is a short acting hypnotic unrelated to other general anaesthetic agents. It is a well accepted and widely used drug for sedation in ophthalmic surgery because of its high clearance and favourable recovery profile.¹⁰

Remifentanil is a short-acting opioid analgesic drug, given to patients during surgery to relieve pain.¹¹ It is often used for the provision of analgesia in mechanically ventilated critically ill patients. Its rapid onset of action quickly achieving steady state makes it useful to reduce pain during retrobulbar nerve block for cataract surgery.

Although this subject was previously evaluated by different investigators, we thought it would be wise to study the efficacy of these drugs in our patients as the vast majority of our cataract operations are done under local anaesthesia.

Materials and Methods

A prospective randomised double blind study conducted in King Hussein Medical Center in Royal Medical Services during the period between September 2004 and August 2005. 160 patients undergoing extra capsular cataract extraction surgery under retrobulbar anaesthesia were enrolled in the study. Informed consent was taken from all patients.

Patients were randomly divided into four groups (40 patients in each group) and received different drug combinations by the same anaesthetist as follows: remifentanil 0.3 microgram/kg (group 1), propofol 0.5 mg/kg (group 2), remifentanil 0.3 microgram/kg and propofol 0.5 mg/kg (group 3) and saline 0.1 ml/kg as a placebo (group 4); this group was informed that it will have saline as placebo. Drugs were given as an intravenous bolus one minute prior retrobulbar injection. All patients received 0.015 mg/kg midazolam. This was given to ensure all patients had the same degree of analgesia before receiving drugs. All patients fasted overnight and did not receive any premedication. On arrival in the operating room intravenous access was established. Monitoring consisted of electrocardiography, pulse oximetry and blood pressure measurement.

Patient's movement and pain were observed during the injection. Patient movement was considered significant if it interfered with the block administration. Pain was rated on a 10 cm visual analogue scale. Heart rate, respiratory rate and haemoglobin oxygen saturation were observed every minute for 10 minutes after the block. Descriptive analysis as well as P-value was used as statistical analysis methods. P- value was considered to be significant if it was ≤ 0.05 .

Results

The mean age of all patients was 64.6 years with a male: female ratio of 1.1: 1. Patients in all groups were comparable regarding age, sex, body mass index and presence of chronic medical illnesses (Table 1). Significant movements were less in the three study groups than in the control; there was no significant movement in group 3 patients who received remifentanil and propofol combination. The mean visual analogue score was 2.3 in group 3 compared to 6.7 in group 4 (Table 2). There was no significant change in mean heart and respiratory rates and haemoglobin oxygen saturation among the three study groups.

Table 1: Patient distribution in all groups.

Characteristic	Group 1	Group 2	Group 3	Group 4
Mean age (years)	64.3	65.2	66.1	62.9
Male: Female	1.1:1	1.2:1	1:1	1.1:1
Mean body mass index	26.3	27.4	28.6	26.7
Cardiovascular disease	18	17	19	17
Respiratory disease	9	9	8	8
Diabetes mellitus	11	9	11	10

Table 2: Factors observed during block replacement in all groups.

Factor	Group 1	Group 2	Group 3	Group 4
Number of patients with significant movement	1	3	0	20
Average visual analogue pain score	2.8	3.9	2.3	6.7
Change in heart rate (beats/min)	-5.2	-4.8	-5.8	4.7
Change in respiratory rate (breath/min)	-2.1	-2.2	-2.5	3.8
Change in Haemoglobin Oxygen saturation (%)	1.8	2.1	2.5	0

Table 3: Number of patients having bradycardia, decreased respiratory rate or decreased haemoglobin oxygen saturation in study groups and its significance in relation to control group.

Variable	Number of patients and significance			
	Group 1	Group 2	Group 3	Group 4
Bradycardia more than 20%	2 $0.1 < p < 0.2$	1 $0.3 < p < 0.5$	3 $0.05 < p < 0.1$	0
Decrease in respiratory rate more than 20%	3 $p > 0.5$	4 $0.3 < p < 0.5$	5 $0.2 < p < 0.3$	2
Haemoglobin oxygen saturation less than 90%	0	0	0	0

Two patients developed more than 20% decrease in basal heart rate in group 1, while one patient in group 2 and three patients in group 3 developed so. More than 20% decrease in respiratory rate occurred in three patients of group 1, four patients of group 2, and five patients in group 3. No patient in any group developed apnoea or a decrease in haemoglobin oxygen saturation below 90% (Table 3).

Discussion

Retrobulbar nerve block is associated with significant pain and anxiety. Several studies investigated the use of sedatives and opioids to relieve this pain and anxiety.

Leidinger W and his colleagues found that patients undergoing retrobulbar block, 0.3 microgram/kg remifentanyl over 30 seconds significantly reduced their reported pain and that remifentanyl did not increase the risk of untoward side-effects.¹² In a study done by Boezaart AP and others, respiratory depression with remifentanyl was mild and not clinically significant. Also, remifentanyl sedation was superior to sedation with propofol¹³. In our study we found that a combination of remifentanyl 0.3 microgram/kg and propofol 0.5 mg/kg is relatively safer than each drug when given alone regarding patient pain and movements during placement of the block (as shown in Table 2). It was associated with slightly more decrease in heart and respiratory rate but none of these were clinically or statistically significant.

Half of the control group patients developed movements that interfered with the placement of the block; three patients of these developed retrobulbar haemorrhage. In the study groups, three propofol-patients, one remifentanil-patient and no patient in the combination group had such movements. This finding was significant comparing any of the study groups with the controls ($p < 0.01$). There was descriptive evidence that combination treatment receiving group had less significant movements than propofol- only or remifentanil- only receiving group although this was not significant.

Regarding pain, the mean visual analogue score was 2.3 in group 3 compared to 6.7 in the control group. Again, each group alone had less pain which statically significant when compared with the control, but this not the case when each group was compared with the other; however, combination group had the least pain in terms of descriptive analysis. This means that group 3 patients were less awake than those of the control group during drug injection and this was the ultimate goal of such drug combination. The difference in the state of wakefulness resulted in different visual analogue scores. A Visual Analogue Scale is a measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured. For example, the amount of pain that a patient feels, ranges across a continuum from none to an extreme amount of pain.¹⁴ One drawback is that such an assessment is highly subjective, these scales are of most value when looking at change within individuals, and are of less value for comparing across a group of individuals at one time point.

We measured heart rate, respiratory rate and haemoglobin oxygen saturation after a ten minute period of bed rest in supine position before the administration of drugs. We observed these variables each minute for ten minutes. The value of maximum change in these variables was subtracted from the basal value to calculate the change in the variable.

There was slight insignificant decrease in heart rate, respiratory rate and haemoglobin oxygen saturation in the combination group (a minus sign in Table 2 opposed to positive in the control group standing for an increase in heart or respiratory rates). No statistically significant difference was found between the three study groups and the control group for decrease in heart and respiratory rates of more than 20%. None of all patients developed apnoea or a decrease in haemoglobin oxygen saturation below 90%. The lack of statistical significance between different drugs indicates that they relatively had the same safety effect.

In conclusion, a combination of remifentanil 0.3 microgram/kg and propofol 0.5 mg/kg is considered to provide excellent relief of pain with least patient movement and minimal respiratory and cardiac side effects in patients undergoing cataract surgery under retrobulbar anaesthesia.

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المقارنة بين فعالية كل من ريمفينتانيل أو بروبوفول أو كليهما في تهدئة الألم في أثناء إحصار العصب خلف البصلة

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الملخص:

المقارنة بين فعالية كل من: ريمفينتانيل، بروبوفول ومزيج بينهما في تهدئة الألم في أثناء إحصار العصب خلف البصلة.

الطرق:

تمت دراسة 160 مريضاً أجريت لهم عملية إزالة الساد من العين تحت تأثير البنج الموضعي خلف البصلة في مدينة الحسين الطبية. تم تقسيم المرضى إلى أربع مجموعات: ريمفينتانيل 0.3 ميكروغرام/كغم؛ بروبوفول 0.5 ميكروغرام/كغم؛ مزيج منهما؛ وملحي 0.1 مل/كغم، حيث تمت ملاحظة الألم وحركة المريض في أثناء الحقن.

النتائج:

لم تحدث أية حركة مؤثرة في المجموعة الثالثة في أثناء الحقن مقارنة مع نصف المرضى في مجموعة الملاحظة (متوسط الإحراز الابصاري المضاهي 2.3 و 6.7 في كلتا المجموعتين على التوالي).

الخلاصة:

إنه لمن الأفضل إعطاء مزيج من ريمفينتانيل 0.3 ميكروغرام/كغم و بروبوفول 0.5 ميكروغرام/كغم في أثناء عملية إزالة الساد من العين تحت تأثير البنج الموضعي من حيث تفريغ الألم وتقليل الحركة وقلة الآثار الجانبية على الجهاز التنفسي والقلب.

الكلمات الدالة:

خلف البصلة، ريمفينتانيل، بروبوفول، تهدئة الألم.