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Fentanyl versus tramadol as a supraclavicular brachial plexus blockade (BPB)

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Abstract

In the anesthetists regarding the utilize of opioids as adjuvants in brachial plexus blockade (BPB) have low information. We compared between fentanyl versus tramadol as local anesthetic in supraclavicular BPB. The study was conducted on 50 patients who were grouped to Group F: received 2 ml of fentanyl; and Group T: received 2 ml of tramadol. Data was collected for the onset and duration of nerve block. There was a significantly shorter time to the onset of sensory and motor nerve blockade (p = 0.01) in Group T compared to Group F. The time to first analgesic requests was significantly longer in the Group T compared to the Group F (p = 0.01). Tramadol in ultrasound-guided supraclavicular BPB produces a significantly prolonged analgesia with a shorter onset of nerve blockade.

Key words: *Fentanyl; Tramadol; Ultrasound-guided supraclavicular block*

Introduction

Supraclavicular brachial plexus block (BPB) is an alternative technique to general anesthesia, which is fast onset and good block [1]. The ultrasound is the gold standard in BPB, which perform the local anesthetic too close to the nerves and thus improving the success rate [2]. Tramadol is a synthetic 4-phenylpiperidine analog of codeine that has a unique mode of action by stimulates the μ receptor and to a lesser extent the δ and κ-opioids receptors. By its non-opioid mechanism, it motivates

inhibition of pain of spine by decreasing the reuptake of norepinephrine and serotonin from ends of nerve and strengthens the effect of local anesthetics [3]. Whereas fentanyl is a potent synthetic μ–receptor stimulating opioid [4]. Many controversies have been documented among the previous studies for the use of different opioids as adjuvants in BPB [5], yet, only a little studies compared the use of fentanyl versus tramadol as an adjunct supraclavicular BPB.

We investigated the analgesic efficacy of fentanyl versus tramadol in patients undergoing orthopedic surgery using ultrasound-guided supraclavicular BPB.

Methodology

Study design and setting

A prospective study was conducted on 50 patients who were scheduled for upper limb orthopedic surgeries. Patients aged between 20 and 55 year, of both gender, and belonging to the American Society of Anesthesiologists (ASA) physical status II/III were included in the study.

Exclusion criteria

1. Bleeding disorders.
2. Opioid analgesics prior surgery.
3. Seizures.
4. Co-morbid diseases.
5. Infections.
6. Pregnancy.

Procedure

Preoperatively, all were shown a visual analog scale (VAS) for pain description was used. All patients were fasting at morning before the procedure. The standard monitoring was connected and peripheral intravenous (I.V.) line with a cannula was performed in the contralateral hand. Intra venous fluids infusion started. Sedative was given intravenously. Patients were randomly classified into two groups: Group F (fentanyl group= 25): patients received fentanyl [100 μg (2 ml)], and

Group T (tramadol group= 25): tramadol [100 mg (2 ml)]. Ultrasound-guided supraclavicular BPB was performed using a 10 MHz linear probe [6]. Patients were evaluated for onset time of according to scale: Grade 0 = normal, Grade 1 = loss of cold sense (analgesia), Grade 2 = loss of touch sense (anesthesia) for sensory. Whereas the onset of motor blockade using the modified Bromage scale [Grade 0: Normal; Grade 1: Decreased strength; Grade 2: Complete block] [7]. Also, the duration of sensory block and the duration of motor block were measured.

Ethical approval and patient consent

This study was approved by the Ethical Committee. Written informed consent was obtained from the parents.

Statistical analysis

Data were analyzed by statistical package for the social sciences (SPSS) program for statistical analysis (version 20; SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean ± SD. Qualitative data were expressed as frequency and percentage. Chi-square $\chi 2$- test was used for comparison between two or more independent qualitative variables. A $p < 0.05$ was considered statistically significant.

Results

There was no significant difference in age, gender distribution, or BMI of the patients between the groups. Also, ASA status and surgery duration were have no statistical significance, as shown in Table 1.

The mean time for the onset of sensory block in Group F, and Group T was 12.55 ± 2.72, and 10.54 ± 2.88 min, respectively, which revealed that the time for onset in Group T was significantly faster compared to Group F ($p = 0.01$). While the mean time for the onset of motor block was 15.82 ± 1.99 min for Group F and 11.85 ± 2.59 min for Group T, which is statistically showed that the time for the onset in Group T was significantly faster ($p = 0.01$). The duration of time of the sensory and motor blockade showed no statistically significant difference ($p = 0.1$), as shown in Table 2.

Table 1. Patients' characteristics and surgical profile of the study groups

Variables		Group F	Group T	P value
Age (mean± SD) years		32.5±7.75	34.2±9.43	0.6
Gender [No. (%)]	Male	15 (60)	13 (52)	0.3
	Female	10 (40)	12 (48)	0.09
BMI (mean± SD) Kg/m^2		29.6±8.98	31.5±6.46	0.06
ASA [No. (%)]	II	20 (80)	18 (72)	0.08
	III	5 (20)	7 (28)	0.1
Surgery duration (mean± SD) min		92.5±20.45	101.3±18.69	0.5

Table 2. Onset and duration of nerve block.

Nerve block		Group F	Group T	P value
Sensory	Onset (min)	12.55±2.72	10.54±2.88	0.01
	Duration (h)	6.25±2.23	11.62±2.65	0. 1
Motor	Onset (min)	15.82±1.99	11.85±2.59	0.01
	Duration (h)	7.52±1.68	9.12±2.34	0.1

Discussion

Supraclavicular BPB provides all anesthesia for the upper limb surgeries, which has been correlated with a shorter hospital stay, low financial burden, and it avoids complications associated with general anesthesia.

The main findings of our study showed that patients in the tramadol group have a longer time for the first rescue analgesic dosage with a prolonged analgesia time than patients in fentanyl. Furthermore, the onset of sensory blockade was significantly faster in the tramadol group compared fentanyl groups. Also, the total duration of sensory block in the tramadol group was significantly longer than

in the fentanyl. In addition, the onset of motor blockade was quicker in the tramadol group than in the fentanyl groups.

Agreement with our data, Nagpal et al. in their study confirmed that when tramadol plus bupivacaine were injected perineurally for supraclavicular BPB, they sped up the onset of sensory block, motor block and prolonged the time to rescue analgesia as compared to the other two groups [4].

Shin et al. in a systematic review and meta-analysis included 16 studies that examined the impact of the addition of tramadol to local anesthetics for BPB and indicates that use of tramadol as an adjuvant to LA in PBP prolongs the duration of sensory block, motor block, and shortens the time to onset of sensory block and motor block [8]. Matching with previous results, Kumaran and Haribaskar [1] evaluated the efficacy of tramadol (2 mg/kg) in the supraclavicular block in a study of 60 patients undergoing upper limb surgery. They found that patients in tramadol group had a shorter time of onset and a longer duration of sensory and motor blockade. Rajkhowa et al. found that using fentanyl as an adjuvant in BPB extends sensory and motor duration by 3 h, and they speculate that the mechanism of fentanyl in prolonging analgesia could be due to the presence of peripheral functional opioid receptors [9]. However, Kiran et al. discovered that the onset time of the sensory block in the fentanyl group was delayed compared to the control group ($p = 0.01$) [10]. This difference from our results could be explained by the different local anesthetics used during that time.

Allene et al. compared the efficacy of tramadol versus fentanyl for axillary block and founded that the onset of complete sensory and motor block was shorter in the fentanyl group [11]. Furthermore, the tramadol group had significantly longer mean duration of sensory and motor blockade. The most likely reason for this dissimilarity from our findings is due to factors related to the difference in the approach of axillary approach versus supraclavicular BPB.

Conclusion

We conclude that tramadol as an adjuvant, shortens the onset time of both sensory and motor blocks and prolongs the analgesia time when compared to fentanyl in supraclavicular BPB.

Conflict of interesting: None

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