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Comparison of Postoperative Analgesic Effect of Tramadol With Lidocaine When Used as Subcutaneous Local Anesthetic

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Abstract: We conducted a double blind, controlled trial comparing postoperative analgesic effect of tramadol with lidocaine when used as subcutaneous local anesthetic. Seventy ASA physical status 1 or 2 patients aged 20-50 years, who were scheduled for elective surgery under general anesthesia with flank incision, were randomly assigned to receive either 2 mg kg^{-1} tramadol or 1 mg kg^{-1} lidocaine at the end of operation. Postoperative pain was evaluated with a Verbal Analogue Scale (VAS). First VAS and patient's satisfaction with operation were recorded at recovery room, second record was in the ward (12 h later) and third on the next day of surgery (24 h later). Local reactions, nausea and vomiting in recovery and the ward and time to first request for analgesic after operation were also recorded. Satisfaction with operation in recovery room was better in tramadol group ($p = 0.016$). The VAS score did not differ significantly between the two groups in recovery ($p = 0.119$), 12 h ($p = 0.316$) and 24 h after the operation ($p = 0.108$). Time to first analgesic requirement in tramadol group was longer (4.3±0.3 h) than lidocaine group (2.1±0.9 h) ($p = 0.012$). Ten patients in tramadol and 2 in lidocaine group had nausea in recovery room ($p = 0.01$). Eight and three patients had nausea in the ward, respectively ($p = 0.101$). There was not significant difference in vomiting between two groups in the recovery and the ward ($p = 0.106$ and $p = 0.112$, respectively). No local reactions were recorded in either group. This study showed that subcutaneous administration of tramadol provided local anesthesia equal to lidocaine with longer pain-free period after operation.

Key words: Tramadol, lidocaine, local anesthetics, pain

INTRODUCTION

Tramadol is a synthetic centrally acting opioid. It is postulated that it has a local anesthetic effect similar to that of lidocaine following intradermal injection and is effective in the treatment of pain (Bamigbade *et al*., 1997; Pang *et al*., 1999; Roux and Coetzee, 2000; Shipton, 2000).

The local anesthetic effect of tramadol on peripheral nerves has been shown in both clinical and laboratory studies (Altunkya *et al*., 2003; Mert *et al*., 2006, 2007).

The local analgesic efficacy of tramadol following intraplantar injection was evaluated. They found that antinociceptive potency of tramadol was higher and long-lasting than that of lidocaine (Mert *et al*., 2007).

The analgesic effects of subcutaneous tramadol on postoperative pain after minor surgeries (lipoma excision and scar revision). They found that the postoperative pain free period was significantly prolonged and less analgesics were required in tramadol group (Altunkaya *et al*., 2003).

Postoperative pain after flank incision is sever and usually the patients require more analgesic. Since longer-lasting analgesic or anaesthetic effects during field block are achieved by injecting the large volumes and adding vasoconstrictors to slow down absorption from the site of injection that may increases local anesthetic side effects, we conducted a study to compare the local anesthetic effect of subcutaneous tramadol with lidocaine.

The objective of this study was to evaluate the effect of subcutaneous tramadol, on the degree of postoperative pain, amount of postoperative analgesic consumed after flank incisions and post operative complications in patients undergoing general anesthesia.

MATERIALS AND METHODS

This randomized, double-blind clinical trial was performed in Dr. Shariati Hospital of Tehran University of Medical Sciences in 2006. The study protocol conformed to the ethical guidelines of the 1989. Declaration of Helsinki and was approved by the investigational review

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board of Dr. Shariati Hospital. Seventy ASA physical status I or II patients aged 20-50 years, who were scheduled for elective surgery under general anesthesia with flank incision were studied and written informed consent was obtained from all subjects.

American Society of Anesthesiologists (ASA) classification for risk of anesthesia based on the physical condition of the patient independent of the planned operation. ASA I: A normal healthy patient, ASA II: A patient with mild systemic disease that results no functional limitation.

Exclusion criteria included the presence of liver diseases, renal failure, sensitivity to tramadol or lidocaine and pregnancy. On arrival in the operating room, ECG electrodes and non Invasive Blood Pressure (NIBP) monitor were applied and oxygen saturation was monitored by pulse oxymeter. The patients were randomly assigned to receive either 2 mg kg^{-1} tramadol (Tramadol TC-50®; IPIDC. Tehran Chemie, Iran) (Group T, n = 35), or 1 mg kg^{-1} lidocaine (LIGNODIC®; IPIDC Rasht-Iran) (Group L, n = 35).

Randomization was based on computer-generated codes that were concealed until interactions were assigned. The coded syringes were prepared by an independent anesthetist in equal volume and shape there fore both the anesthesiologist and the patient was blinded to the group assignment. Both of the solutions, were diluted to 20 mL containing 1/200,000 adrenaline. At the end of surgery with the same anesthetic technique and before skin closure the prepared solution was injected in subcutaneous tissue with a 25-guaged needle mounted to the syringe by the surgen who also was not aware of the given medication. Postoperative pain was evaluated with a Verbal Analogue Scale (VAS) in which no pain was graded as zero and the most excruciating pain as 10 for the first 24 h. First VAS and also patient's satisfaction with operation were recorded at recovery room (1 h after operation). Second VAS record was in the ward (12 h later) and third on the next day of surgery (24 h later). Local reactions (rash, erythema and urticaria), nausea and vomiting in the recovery and the ward and also time to first request for analgesic after operation were also recorded.

Statistical analysis: A sample size of 35 in each group will be sufficient to detect a difference of 3 points on the VAS between them, assuming a standard deviation of 3.5 points, a power of 95% and a significance level of 5%. Normality of distribution was tested by Kolmogorov Smirnov test. Data were analyzed by SPSS version 11.5 (SPSS Inc., Chicago, IL) and were compared by using independent sample t-test, Mann-Whitney U-test, Chi-square and fisher's exact test. $p<0.05$ was considered statistically significant.

RESULTS

Demographic data and the duration of surgery were not significantly different between the two groups (Table 1) (independent sample t-test and Chi-square).

Arterial blood pressure, heart rate and peripheral oxygen saturation remained stable during the operation. The VAS score did not differ significantly between the two groups in the recovery ($p = 0.119$), 12 h ($p = 0.316$) and 24 h after the operation ($p = 0.108$) (Mann-Whitney test) (Table 2). Satisfaction with operation in the recovery room was significantly better in the tramadol group ($p = 0.016$, Chi-square) (Table 3).

Time to first analgesic requirement in tramadol Group (4.3±0.3 h) was significantly longer than lidocaine Group (2.1±0.9 h) ($p = 0.012$, independent sample t-test).

Patients in tramadol group had more nausea than lidocaine group in the recovery room (10 versus 2 patients, respectively) ($p = 0.01$, Chi-square).

Five patients in tramadol and 3 patients in lidocaine group had nausea in the ward, this difference was not statistically significant ($p = 0.101$, Fisher's Exact Test).

There was not significant difference between the two groups for vomiting in the recovery and the ward ($p = 0.106$, $p = 0.112$, respectively, Fisher's Exact Test).

No local reactions were recorded in either group.

Table 1: Demographic data in the study groups

Data	Lidocaine (n = 35)	Tramadol (n = 35)
Sex (M/F)	19/16	18/17
Age (years)*	28.6±5.9	28.4±5.8
ASA (I/II)	24/11	24/11
Weight (kg)*	68.7±8.3	66.8±7.4
Duration of surgery (min)*	148±20	141±19

*: Data are presented as mean±SD

Table 2: Verbal Analogue Scale (VAS) for postoperative pain evaluation in recovery room (VAS1), 12 h later (VAS2) and 24 h after operation (VAS3) between the study groups

VAS time	Lidocaine group (n = 35)	Tramadol group (n = 35)
VAS1	2 (0-6)	2 (0-6)
VAS2	2 (0-8)	2 (0-6)
VAS3	4 (2-8)	4 (2-6)

Data are presented as median (Range)

Table 3: Percent of patient's satisfaction with operation in recovery room in the study groups

Patient's satisfaction with operation	Tramadol (n = 35) No. (%)	Lidocaine (n = 35) No. (%)
Very good	10 (28.6)	2 (5.7)
Good	24 (68.6)	28 (80)
Bad	1 (2.9)	5 (14.3)

DISCUSSION

This study showed that subcutaneous administration of tramadol after flank insicion provided postoperative local anesthesia equal to lidocaine. Tramadol extended the pain-free period after operation. There were no local reactions in either groups but nausea in recovery room was more in tramadol group.

Initially, it was thought that tramadol produced its antinoceptive and analgesic effects through spinal and supraspinal sites rather than via a local anesthetic action (Langois *et al*., 2002). However, several clinical studies have shown that it might have peripheral local anesthetic type properties (Pang *et al*., 1999; Kaparal *et al*., 1999; Acalovschi *et al*., 2001; Altunkaya *et al*., 2003). By direct tramadol application to the sciatic nerve in rats, it was proven that tramadol exerts a local anesthetic type effect (Acalovschi *et al*., 2001).

The local anesthetic and post operative analgesic effects of tramadol with lidocaine in 40 patients for minor surgery performed using local anesthesia. They found no significant difference in pain and local reaction that was correlated with present study. They also found that the length of time to first analgesic medication was longer in tramadol than lidocaine group ($p = 0.01$) that was similar to our study (Altunkaya *et al*., 2003).

The antinociceptive effects of tramadol $CaCl_2$ or naloxone combinations after subcutaneous intraplantar injection in a validated rat model (Mert *et al*., 2006). They compared local analgesic effect of tramadol with lidocaine and found that antinociceptive potency of tramadol was higher and long-lasting than that of lidocaine. Their results were correlated with our study in longer pain free period with tramadol.

In present study both drugs had equal local anesthetic effects that was not similar to Mert *et al*. (2007). study, this may be due to combining tramadol with $CaCl_2$ in their study which can modified the effect of tramadol. Differences between the effects of tramadol and lidocaine may also be due to different local analgesic action mechanisms of tramadol than that of lidocaine (Mert *et al*., 2002, 2006).

Our limitation was performing block under general anesthesia so we couldn't evaluate the local effect of tramadol immediately after insicion.

In conclusion this study showed that subcutaneous administration of tramadol provided local anesthesia equal to lidocaine, longer pain-free period after operation but more nausea in the recovery room. Since tramadol increases pain free period after operation with sever pain (flank insicion) and dose not increase side effects significantly, it can be used for local anesthesia instead of lidocaine.

Further studies may be required for evaluating the mechanisms of local anesthetic effect of tramadol and comparing it with other local anesthetics in different operations.

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