

Evaluating the quality of intravenous regional anesthesia following adding dexamethasone to lidocaine

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ABSTRACT

Objectives: The quality of anesthesia in intravenous regional anesthesia (IVRA) has been evaluated in many studies so far. This study was designed to evaluate the effects of adding the dexamethasone to lidocaine on the quality of IVRA. **Materials and Methods:** A double-blind clinical trial was set up involving 50 hand surgery candidates, 20 to 55 years old, and with American Society of Anesthesiologists class of I and II. Patients were randomly allocated into two groups of 25 cases and received either 3 mg/kg of lidocaine (control group) or 3 mg/kg of lidocaine plus 8 mg of dexamethasone (study group). The onset and recovery times from sensory and motor blocks, the starting time of tourniquet pain, the amount of narcotics needed during patients' recovery, and probable side-effects were all compared between the two groups. **Results:** No significant differences were detected concerning age, gender, length of surgery and the mean time of starting of tourniquet pain between the two groups. The mean times of both sensory ($P = 0.002$) and motor ($P = 0.004$) blocks onset were significantly shorter in the study group. The mean time of recovery from sensory block was significantly longer in the study group ($P = 0.01$). The average amount of narcotics needed during the recovery was significantly lower in the study group ($P = 0.01$). No side-effect was detected. **Conclusion:** We conclude that adding the dexamethasone to lidocaine can improve the quality of anesthesia in IVRA.

Key words: Analgesia, anesthesia, conduction, dexamethasone

INTRODUCTION

Intravenous regional anesthesia (IVRA) or Bier's block was first introduced by August Bier, a German surgeon, in 1908. This anesthesia technique is considered easy with fast anesthesia induction, fast recovery, fast muscle relaxation, and with better ability to control anesthesia region. All these characteristics have made the technique an appropriate choice for open surgeries with short duration (60-90 min) as well as for reduction of closed fractures. The technique has also proved to be safe and effective even in emergency and outpatient cases because of its cost-effectiveness and convenience.^[1-3]

An ideal anesthetic agent for IVRA should have rapid analgesic effect to reduce tourniquet pain and its effects should last longer enough after deflating tourniquet. To achieve this, other drugs including narcotics, nonsteroidal anti-inflammatory drugs, ketorolac, clonidine, nitroglycerin (TNG), dexmedetomidine, magnesium, and neostigmine were used in combination with lidocaine in different studies.^[1-8] TNG has been used as an adjuvant with many anesthetic drugs to induce fast effect in controlling acute and chronic pains. It can facilitate the analgesic effect of oral Morphine in controlling cancer chronic pain. Many studies have so far indicated that adding TNG to lidocaine in IVRA could decrease tourniquet and postsurgery pains.^[3,9-14] In the last 15 years, the analgesic effect of betamethasone, dexamethasone, and methylprednisolone has been shown in many surgeries. Theoretically dexamethasone is effective in controlling pain of surgical tissue damage. Doses of 8-40 mg dexamethasone have been used for controlling postoperation pain. Similarly, some studies indicated that adding the dexamethasone to intravenous lidocaine could increase the duration of analgesia following deflating tourniquet.^[15-17] Considering

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the high number of hand surgery cases, and the need for a reliable, regional anesthesia technique, IVRA can potentially be an appropriate substitute for general anesthesia in these patients. This study evaluated the effect of adding the dexamethasone to lidocaine on improving the quality of IVRA in hand surgery cases.

MATERIALS AND METHODS

The Ethical Committee of the Urmia University of Medical Sciences approved the study protocol. A double-blind clinical trial was set up including 50 cases of hand surgery with class I and II in American Society of Anesthesiologists and age ranging from 20 to 55 years. The sample size was chosen based on reviewing similar previous studies^[18,19] as well using normogram for standardized difference of 0.75% and 85% power.^[20] Twenty-five patients were randomly allocated to each of control and study groups. In the operating room and following measuring of vital signs, patients in the control group received 3 mg/kg of lidocaine, and patients in the study group received 3 mg/kg of lidocaine plus 8 mg of dexamethasone intravenously.

Sensory block was tested with pinprick cutaneous test on the dermatomes of median, ulnar, and radial nerves every 30 s. Motor block was tested with the ability to move wrist and fingers. After sensory and motor blocks, distal tourniquet was inflated, and the proximal one was deflated. Patients' tourniquet pain was measured with visual analog score (VAS) in 5, 10, 20, and 30 min after deflating proximal tourniquet. Fentanyl 1 µg/kg was administered whenever the patients' VAS was >3. The administration time and the total amount of fentanyl for each patient were recorded. Operations started 10 min after the block. Tourniquet was not deflated unless at least 30 min past operations' starting time. The recovery time from sensory block was tested using the pinprick test on all dermatomes of patients' palm after deflating tourniquet. The recovery time from the motor block was tested with the ability to perform flexion and extension of fingers and wrist after deflating tourniquet.

RESULTS

There were no significant differences concerning gender, age, and the duration of operation between the two study and control groups [Table 1].

The mean starting times of both sensory (2.69 ± 1.13 vs. 4.02 ± 1.13) and motor (3.78 ± 1.89 vs. 5.98 ± 2.78) blocks were significantly shorter in the study group compared to control group ($P < 0.05$). The mean recovery times from both

sensory (8.66 ± 4.41 vs. 5.64 ± 2.53 min) and motor (9.32 ± 5.21 vs. 5.60 ± 3.45 min) blocks were significantly longer in the study group compared with control group ($P < 0.05$). The mean time of starting tourniquet pain was slightly (but not significantly) longer in the study group ($P = 0.08$) [Table 2].

As it can be seen in Table 3, there was also a significant difference between the two groups concerning the mean dosage of administered Fentanyl ($P < 0.05$).

In this study, no local anesthetic agent was infiltrated in the wounds and the data collection did not include postoperative ward care. We did not detect any complication related to the administered drugs.

DISCUSSION

As we mentioned, the objective of the current study was to find out whether adding the dexamethasone to lidocaine in Bier's block could improve the quality of IVRA. Considering fair number of some small orthopedic surgeries, improving the quality of IVRA, can provide appropriate regional anesthesia while avoiding side effects of general anesthesia. Hence, it can save time and money, and augments patient safety.

Our results showed that the mean starting time of sensory block was shorter in the study group compared

Table 1: Comparing gender, age, and the duration of operation between the two groups

Variable	Study group	Control group
Gender (male/female)	15/10	13/12
Age (year)	32.8±13.26	37.7±15.8
Duration of operation (min)	43.2±7.47	42.80±11.46

Table 2: Comparing the mean times of sensory and motor blocks and starting tourniquet time between the two groups

Variable (min)	Study group	Control group	P
Sensory block	2.69±1.113	4.02±1.13	0.002
Sensory recovery	8.66±4.41	5.64±2.53	0.01
Mot or block	3.78±1.89	5.98±2.78	0.004
Motor recovery	9.32±5.21	5.60±3.45	0.0001
Tourniquet pain time	44.17±5.84	40±5.34	0.08

Table 3: Comparing the fentanyl administered between the two groups

Variable	Study group	Control group	P
Mean fentanyl consumption (µg)	36±36.85	80±35.35	0.001

to the control group. This finding is in accord with previous studies. Abbasivash *et al.*^[3] evaluated the effect of adding TNG to lidocaine in IVRA and concluded that the mean starting time of sensory block in TNG plus lidocaine group was shorter than lidocaine only group. In another study by Elmetwaly *et al.*,^[18] the effect of adding ketamine or TNG to lidocaine on the quality of IVRA was evaluated. The study showed that both combinations could induce sensory block faster than lidocaine only. Our results are also in accord with the studies mentioned above with respect to the effects of adding an adjuvant drug to lidocaine. The effect, of adding ketorolac or dexamethasone to lidocaine in IVRA, was evaluated in a study by Jankovic *et al.*^[17] Their results showed that the mean time of starting of sensory block between the three groups did not change significantly. However, the mean time of recovery from sensory block was significantly longer in lidocaine plus dexamethasone plus ketorolac group comparing to lidocaine only group. Likewise, in our study the main time of recovery from sensory block was significantly longer in lidocaine plus dexamethasone group in comparison to lidocaine only group. Another study by Bigat *et al.*^[19] yielded similar results to those of ours; that is, the mean time of recovery from sensory block was longer and the mean time of recovery from motor block was shorter in lidocaine plus dexamethasone group. Contrary to our findings, in a study by Jankovic *et al.*,^[17] there was no significant difference in the meantime of recovery from sensory block between the lidocaine and lidocaine plus dexamethasone groups. In addition, in a study by Sen *et al.*^[21] the mean time of recovery from the motor block in the lidocaine plus dexamethasone was even longer than the lidocaine only group. Other studies including a study by Bigat *et al.*,^[19] however, reported results similar to those of ours. Although, many studies reported that adding the dexamethasone to lidocaine could increase the time of starting tourniquet pain,^[3,17,18] we could not find any significant difference in this regard. However, in our study the need for administering fentanyl during the operation and recovery times was reduced in the lidocaine plus dexamethasone group significantly.

CONCLUSION

Our study yielded important results that in many regards were in line with the findings of other studies. The results showed that the mean starting time of sensory block were reduced following adding the dexamethasone to lidocaine. This is an essential element that can save time and help providing a favorable anesthetic condition for patients. In addition, dexamethasone could elongate recovery from sensory block and a decrease need for

narcotics. These findings substantiate proving a more favorable anesthetic condition by adding dexamethasone to lidocaine. The advantage of this method becomes even more evident by the fact that no side-effect was detected. Therefore, adding dexamethasone to lidocaine in IVRA is a promising method for improving the quality of anesthesia.

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