

Effect of Adding Neostigmine in Paravertebral Block on Postoperative Extubation Time in Elective Coronary Artery Bypass Graft Surgery

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Abstract

Introduction-Paravertebral block is a technique of regional anesthesia and is used for a number of purposes. The aim of this study was to assess the effects of adjuvant neostigmine in paravertebral block with bupivacaine for in coronary artery bypass grafting surgery (CABG).

Materials and methods-In total, 68 patients were randomly assigned into two groups: bupivacaine alone (B group) and bupivacaine with neostigmine (BN group) for bilateral paravertebral thoracic block at T6 level. Postoperative times for extubation, morphine requirements, and acute pain scores were assessed.

Results- The BN group patients were extubated sooner. Also, they needed less morphine in the first twenty-four hours.

Discussion- The study suggests that adding neostigmine to bupivacaine in paravertebral block as an adjuvant can have beneficial postoperative effects in patients undergoing elective CABG (*Iranian Heart Journal 2011; 12 (1):35 -39*).

Keywords: neostigmine ■ paravertebral block ■ coronary artery bypass grafting

Paravertebral block is a technique of regional anesthesia in which a needle is inserted just lateral to the vertebral spinal process into the paravertebral space to administer local anesthetic agents; there may, however, be some variations in the technique.¹⁻³ Then, the local anesthetic is injected adjacent to the place where the spinal nerves emerge from the intervertebral foramina,^{4,5} resulting in an ipsilateral somatic and sympathetic nerve block affecting the respective dermatome. A number of the common uses for this type of block are breast and thoracic surgeries, treatment of postherpetic neuralgia in patients with acute herpes zoster, analgesia for rib fractures, and other disease entities.⁶⁻¹¹

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One of the methods used to strengthen the analgesic effects of the drugs is to add an adjuvant drug to the main one.^{3,5}

On the other hand, patients undergoing elective coronary artery bypass grafting surgery (CABG) have limited postoperative spontaneous respiration, especially due to the effects of thoracic pain induced by sternotomy and thoracic retraction during the procedure.¹²

This study was performed to assess the effects of adjuvant neostigmine added to bupivacaine for thoracic paravertebral block on postoperative extubation time in patients undergoing elective CABG.

Materials and methods

The protocol of the study was approved by the institutional Research Committee, Anesthesiology department, School of Medicine, Shahid Beheshti University of Medicine, Tehran, Iran. All the patients admitted to the cardiac operating room of Shahid Modarres Hospital, Shahid Beheshti University of Medicine, constituted the target population of this double-blind, randomized, clinical trial.

This study was done during a twelve-month period. In total, 68 patients were selected and randomly assigned into two groups of 34 patients. Random allocation of the patients was done using a table of random numbers. For the inclusion of the patients into the study, the following criteria were considered: electiveness of the CABG operation with on-pump technique, having informed written consent, age range of 40 to 75 years, and an ejection fraction (EF)>40%. Refusal of the patients for study entry, any history of previous surgical operation on the spinal cord, any history of previous disorders involving the spinal cord, any history of previous disorder underlying the coagulation system (esp. any active bleeding disorders), and any emergency indication for surgery were considered as the study exclusion criteria.

Information regarding the study was given to the patients during the preoperative night visit by a constant colleague. The same procedures were used for the two groups regarding the surgeon, perioperative care, intraoperative anesthesia (including drugs and methods), and postoperative care, as much as possible.

The physician, who dealt with the cases in the operating room, had no role in the postoperative data collection and was unaware of the postoperative study course. Meanwhile, the other colleague and ICU staff had no role in the detection of the specific group each patient belonged to.

The patients, albeit informed of the whole process, did not know which study group they were in.

Paravertebral block was carried out after monitoring each patient inside the operating room (including electrocardiography, invasive arterial blood pressure, and pulse oxymetry) just before the induction of anesthesia, using the standard Eason and Wyatt technique¹⁴ alongside the 6th thoracic level (T6). The bupivacaine + neostigmine group (BN group) received 20 mg bupivacaine (4 mL of 0.5% solution) plus 0.35 mg neostigmine. The plain bupivacaine group (B group) received 20 mg bupivacaine.

The solution was increased to a volume of 10 mL using normal saline. The same volume and dosage of drugs were repeated on the other side. After block confirmation, general anesthesia was induced with a combination of intravenous sufentanil (0.7mcg/Kg), propofol (1 mg/Kg), and pancuronium (0.1 mg/Kg).

For the maintenance of anesthesia, a combination of intravenous sufentanil, atracurium, and midazolam added to inhalational isoflurane was used. In the ICU, the patients were extubated after fulfilling the clinical criteria for extubation.

The time of entry to the ICU until the time of extubation and total morphine requirements in the first twenty-four hours after surgery were documented.

Also, pain scores in the ICU were checked using a 10-score Visual Analog Scale after the patients were extubated. Intravenous morphine was administered to keep the pain score less than 3 of 10.

For data analysis, the Student *t*-test and Chi square test were used. To present the results, mean \pm SD was used and *p* values < 0.05 were considered significant.

Results

There was no difference between the two groups regarding basic variables, including age, sex, body weight, and duration of the surgery (Tables I and II).

The BN group patients experienced less postoperative time to be extubated after the operation in the ICU.

Table I. Demographics of the patients in the two study groups*

	BN group	B Group	P value (for t-test)
Age (years)	58 (11)	57 (9)	> 0.05

Body weight (Kg)	74 (10)	71 (12)	> 0.05
Duration of the surgery (minutes)	241 (21)	238 (19)	> 0.05

*Data are presented as mean \pm (standard deviation)

Table II. Distribution of sex in the two groups*

	BN group	B Group
Male	19	18
Female	15	16

* Chi-square test, degree of freedom = 1, p value > 0.05

In addition, the total postoperative morphine requirements were less in the BN group (Table III). The pain scores six hours after ICU entry were less in the BN group (Table III).

Table III. Time to extubation, analgesia, and pain status in the two groups*

	BN group	B Group	P value (for t-test)
Time to extubation (min)	294 (44)	332 (57)	0.001
Post-op morphine dose (mg)	15 (4)	19 (6)	0.03
Pain scores six hours after ICU entry	1.6 (0.3)	2.5 (0.4)	0.04

*Data are presented as mean \pm (standard deviation)

A number of the patients were excluded from the study because of block failure, which was checked before the induction of anesthesia with the pinprick test: 5 in the BN group and 3 in the B group.

Discussion

The results of this study demonstrated that adding neostigmine to bupivacaine decreased the severity of acute postoperative pain and time needed for extubation of the patients. These findings suggest that neostigmine can be an effective adjuvant for bupivacaine used in paravertebral block for patients undergoing CABG.

The role of paravertebral block for postoperative analgesia after robotic-assisted CABG has been studied.¹⁵ Also, it has been demonstrated that paravertebral block for postoperative analgesia after minimally invasive coronary artery bypass (MIDCAB) surgery is as effective as thoracic epidural anesthesia and analgesia and also, it is easier than thoracic epidural anesthesia and even may be safer.¹⁶ Moreover, it has been demonstrated in a meta-analysis that paravertebral block and epidural analgesia both have comparable potency to suppress the postoperative pain, which is induced by thoracic surgery; nevertheless, paravertebral block ends in fewer side-effects and also is associated with decreased pulmonary complications by 64% when compared with the thoracic epidural technique.¹⁷ The use of neostigmine as an adjuvant for bupivacaine in the paravertebral block of CABG patients has not been studied sufficiently. The results of the present study suggest a new use of Neostigmine, although the utilization of neostigmine in epidural and caudal anesthesia and analgesia has been studied before.^{18, 19}

There are a number of limitations in this study. First, postoperative pain assessment was deficient since a considerable number of our patients were intubated in the first postoperative hours. Second, the measured pulmonary outcome (i.e. time to extubation), albeit considered important in other studies,^{1, 12, and 17} seems not enough and other measures like blood gas analysis seem to be complementary to it.

Finally, this study suggests that adding neostigmine to bupivacaine in paravertebral block as an adjuvant can have beneficial postoperative effects in patients undergoing elective CABG.

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Conflict of Interest

No conflicts of interest have been claimed by the authors.

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