# Influence of Clonidine on Bilateral Cervical Plexus Block using 0.25% Bupivacaine for Postoperative Analgesia following Thyroid Surgery

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**ABSTRACT**

***Background:*** Addition of clonidine to local anaesthetic agent improves the quality and duration of peripheral nerve block. This randomized prospective study was carried out to find the quality and duration of postoperative analgesia by cervical plexus block using bupivacaine and clonidine.

***Patients & Methods :*** Thirty nine patients of ASA grade I and II, undergoing thyroid surgery were randomly allocated in three group to receive 0.25% bupivacaine for cervical plexus block (CPB) and 1 ml normal saline iv (group B), 0.25% bupivacaine + 150 mg clonidine for CPB and 1 ml normal saline iv (group BC I) or 0.25% bupivacaine for CPB and 150 mg clonidine iv (group BC II). Standard anaesthetic technique was used to provide general anaesthesia all patients. In PACU intensity of pain was assessed by VRS.

***Results :*** Duration of analgesia was significantly more in group BC I (8.19 ± 3.2 hour) as compared to group B (5.24 ± 1.6 hour) and group BC II (6.26 ± 1.54 hour). Total consumption of fentanyl citrate in postoperative period was also significantly less in BC I group.

***Conclusion :*** Addition of clonidine to bupivacaine significantly increases the duration and quality of cervical plexus block.

**KEYWORDS :** Thyroid surgery; cervical plexus block; postoperative analgesia; bupivacaine, clonidine.

There is increasing interest in peripheral nerve blocks because of superior quality of postoperative analgesia with fewer side effects, greater patient satisfaction and faster functional recovery after surgery. The addition of analgesic adjuvant to local anaesthetic solution further improves the quality and duration of analgesia.

Clonidine is a selective partial agonist for $\alpha_2$ adrenoreceptors and often used systemically or locally to potentiate the action of local anaesthetic agents. It acts peripherally by blocking conduction through Aa, c fibers and potentiating conduction block of local anaesthetics.[1] Clonidine, in doses of 0.5 mg $kg^{-1}$ or greater, enhances the effect of local anaesthetic used for brachial plexus block[2] and sciatic nerve block.[3]

Sophie Aunac et al[4] added clonidine to ropivacaine agent for cervical plexus block and observed the potentiation of analgesia. Therefore, present study was conducted to evaluate the

1. effect of clonidine on quality and duration of analgesia produced by cervical plexus block using 0.25% bupivacaine and its probable side effects.
2. to find out the possible site of action of clonidine.

## PATIENTS AND METHODS

After obtaining the clearance from hospital ethical committee and written informed consent from patients, study was carried out in patients scheduled for thyroid surgery. Thirty-nine ASA physical status I and II, adult euthyroid patients were included in this randomized prospective study. Patients with known bleeding diathesis, a history of allergy to local anaesthetic agents, local sepsis, chronic pulmonary disease or known diaphragmatic motion abnormalities were excluded from the study.

Assuming that addition of clonidine to 0.25% bupivacaine for bilateral cervical plexus block would reduce the dose of postoperative analgesic by 50%, the number of patients required in each group to observe such reduction was at least 10 with a = 0.05 and b = 0.08. Therefore thirty-nine patients were included in this randomized, prospective study. They were randomly allocated into three groups to receive either of the following solutions for bilateral cervical plexus block.

**Group B :** 0.25% bupivacaine (28 ml) + normal saline (1 ml) for cervical plexus block & normal saline (1 ml) intravenously.
**Group BC I :** 0.25% bupivacaine (28 ml) + 150 mg clonidine for cervical plexus block & normal saline (1 ml) intravenously.
**Group BC II :** 0.25% bupivacaine (28 ml) + normal saline (1 ml) for cervical plexus block and 150 mg clonidine intravenously.

All the patients were instructed on the day before surgery about the study protocol, use of the verbal rating

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scale (VRS) and PCA pump. Patients were premedicated with tablet diazepam 5 mg orally, 2 hour before surgery.

On arrival in the operation theatre, monitors were attached and baseline vital parameters were noted down. An intravenous canula was inserted and injection fentanyl citrate was administered in the dose of 1 mg $kg^{-1}$ of body weight. Patients were induced with intravenous propofol & orotracheal intubation was facilitated by the administration of 0.1 mg $kg^{-1}$ vecuronium bromide. Anaesthesia was maintained with nitrous oxide, oxygen, 0.5% isoflurane and top up dose of vecuronium bromide.

After the induction of general anaesthesia, the bilateral cervical plexus blocks were performed by using drugs as per grouping. Deep cervical plexus block was performed by a technique suggested by Winnie et al.[5] A 23 gauge short beveled needle was inserted behind the lateral border of the sternocleidomastoid muscle, 3 cm distal to the mastoid process. After negative aspiration for blood, 8 ml of solution was injected. The superficial block was performed by using same needle inserted at the midpoint of the lateral border of sternocleidomastoid muscle. After negative aspiration, 6 ml of solution was injected in four directions (1.5 ml in each direction) to block the main branches (lesser occipital, greater auricular, transverse cervical and supraclavicular nerves) of the plexus. The injection was given with unlabelled syringes prepared by an anaesthesiologist not involved in the perioperative management and pain assessment of the patients.

Surgical incision was given twenty minutes after the cervical plexus block and changes in haemodynamics were noted down. Increase in pulse rate more than 20 bpm and systolic arterial pressure >20 mm Hg in response to surgical incision was considered as failure of cervical plexus block and was excluded from the study design.

At the end of the surgical procedure, residual neuromuscular block was reversed by using appropriate dose of neostigmine plus atropine and intensity of pain was assessed. VRS≥4 was considered as failure of block and excluded from the study.

Patients were transferred in postanaesthetic care unit and intensity of pain and vital parameters were assessed after 30 minutes and than an hourly interval. When pain score was ≥4 at rest, PCA pump was started to deliver boluses (25 μg) of fentanyl citrate as per the requirement of the patient. The time was noted down as a duration of analgesia. Total requirement of fentanyl citrate in 24 hours was also noted down.

Procedure related as well as drug related complications such as diaphragmatic palsy, bradycardia, hypotension and excessive sedation were also observed and recorded.

Continuous parametric variables are reported as mean ± SD and were analyzed with analysis of variance. Turkey's tests were used for post hoc comparison. Categorical variables were analyzed with $\chi 2$ tests. Nonparametric data were compared by using Kruskal-Wallis test. A value of $p<0.05$ was considered significant.

## RESULTS

Thirty-nine patients were enrolled but 35 patients completed the study protocol (group B, n=11; group BC I, n=12 and group BC II, n=12). Two patients from group B and one from group BC I were excluded from the study due to significant rise in pulse rate and systolic blood pressure following surgical incision. One patient of BC II group experienced severe pain (VRS>4) following reversal of anaesthesia and excluded from the study.

Demographic characteristics were similar in all groups (Table 1). Intensity of pain was significantly less in group BC I as compared to group B and group BC II at 30 min ($p<0.01$), 2 hour ($p<0.05$) and 6 hour ($p<0.01$) following surgery. However, after 10 hour, intensity of pain was comparable in three groups (Table 2). Duration of analgesia was significantly more in group BC II (6.26 ± 1.54 hour) and group BC I (8.19 ± 3.2 hour) as compared to group B (5.24 ± 1.6 hour). Fentanyl consumption in 1st postoperative day was significantly less BC I group (Table 3).

**Table 1**
*Demographic Profile*

| | Group B Mean ± SD | Group BC I Mean ± SD | Group BC II Mean ± SD |
|---|---|---|---|
| Age (Yr) | 34.6 ± 10.8 | 35.5 ±12.1 | 33.2 ± 11.6 |
| Weight (Kg) | 55.2 ± 12.6 | 53.8 ±11.7 | 52.7 ±18.1 |
| Sex M : F | 2 : 9 | 2 : 10 | 3 : 9 |
| Duration of surgery (minute) | 99.6 ± 32.1 | 106 ±31.9 | 109.8 ±24.2 |

*p = not significant.*

**Table 2**
*Intensity of Postoperative Pain Postoperative Period Intensity of Pain (VRS)*

| Postoperative Period | Group B Mean ± SD | Group BC I Mean ± SD | Group BC II Mean ± SD |
|---|---|---|---|
| 30 min | 2.8 ± 0.96 | 1.81 ± 0.84** | 2.32 ± 1.05 |
| 2 hour | 2.02 ± 0.83 | 1.76 ± 1.09* | 1.95 ± 1.16 |
| 6 hour | 4.04 ± 1.23 | 1.94 ± 1.12** | 3.53 ± 1.21 |
| 10 hour | 3.26 ± 1.31 | 3.36 ± 0.93 | 2.96 ± 0.84 |

** = p<0.05; ** = p<0.01*

## DISCUSSION

Combined superficial and deep cervical plexus block is a technique that was initially developed to avoid general anaesthesia for carotid end arterectomy.[6] This block has been successfully used to perform thyroid surgery.[7]

**Table 3**
*Duration of Analgesia and Opioid Consumption in Postoperative Period.*

| Postoperative Analgesia | Group B Mean ± SD | Group BC I Mean ± SD | Group BC II Mean ± SD |
|---|---|---|---|
| Duration of Analgesia (hour) | 5.24 ± 1.6 | 8.19 ± 3.2** | 6.26 ± 1.54* |
| Fentanyl consumption in 24 hours (mg) | 302.27± 55.29 | 187.5± 27.18** | 258.33± 37.44* |

** p<0.05; ** p<0.01*

Subsequently many clinician used cervical plexus block to provide postoperative analgesia following thyroid surgery.[4] Diendonne et al[8] reported the advantages of bilateral superficial cervical plexus block administered immediately after thyroid surgery, in terms of postoperative pain relief. They observed that 45% and 34% patients did not require opiate analgesics during first 2 hour and 24 hours after surgery. Similarly, in another study by Aunac S and Carlier M4 73% and 69% of the patients with bilateral cervical plexus block were free from pain without any opiates during the first 2 and 24 hours after surgery. Unlike previous reports, all patients in present study felt pain during first 24 hours following surgery and received fentanyl citrate by PCA. Reasons may be the routine use of propacetamol 2g, immediately after surgery by previous workers, which possibly reduced the requirement of opiates in postoperative period.

Addition of clonidine to bupivacaine significantly prolonged the duration of analgesia. Same potentiation was not observed when clonidine was administered intravenously. This suggests a peripheral action of clonidine. Concerning the mechanism of action of clonidine on peripheral nerves, Butterworth and strichartz[9] and Gaumann et al[10] demonstrated a direct neuronal effects of clonidine. In an isolated rabbit vagus preparation, a very small dose of clonidine enhances the effects of lignocaine on C-fiber action potentials[10]. Other investigators proposed that clonidine may exert a peripheral analgesic action by releasing enkephalin like substances.[11,12]

The potential serious complications associated with cervical plexus block include vertebral artery, subarachnoid, or epidural injections and phrenic nerve palsy.[12] Phrenic nerve palsy is the commonest complication, which may produce respiratory distress. Patients were closely monitored for any evidence of respiratory insufficiency in postoperative period. No serious complication was observed in this series.

In conclusion clonidine, as an adjuvant to local anaesthetic for combined deep & superficial cervical plexus block improves the quality & duration of postoperative analgesia, & reduces the consumption of fentanyl citrate by PCA.

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