

ANALGESIC EFFICACY OF COMBINATION OF BILATERAL SUPERFICIAL CERVICAL PLEXUS BLOCK AND STANDARD ANALGESIA WITH STANDARD ANALGESIA ALONE IN PATIENTS UNDERGOING THYROID CANCER SURGERY. A RANDOMISED-CONTROLLED TRIAL

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Abstract

Purpose: This study aimed to determine analgesic efficacy of a combination of bilateral superficial cervical plexus block (BLSCP) and standard analgesia with standard analgesia alone in patients undergoing thyroid cancer surgery under general anaesthesia.

Materials and Methods: It was a randomised-controlled trial conducted at the Anaesthesia Department of the Shaukat Khanum Memorial Cancer Hospital, Lahore. A sample size of 60 patients (30 patients in each group) was calculated with 95% confidence interval and power of 80%.

Results: The mean pain-free duration for the Group A (BLSCP) group was 72 min (SD 30.1) compared to 53 min (standard deviation 30.3) for the Group B. This shows a significant reduction in pain-free duration in Group A. Average NRS pain score in the Group A at 0, 30, 60, 90 and 120 min was (0.83, 1.83, 0.23, 1.76 and 1.49), whereas the average pain score on NRS in the Group B at the same time interval mentioned above for Group A was (2.1, 2.73, 4.53, 2.44 and 1.85)

Conclusion: Administration of BLSCP resulted in superior analgesia after thyroid cancer surgery.

Key words: Analgesia, cervical plexus block, post-operative pain, regional anaesthesia, thyroidectomy

Introduction

Common complications after thyroidectomy are infection, vocal cord paralysis, bleeding and post-operative pain. Recent advancements have minimised most of these surgical complications, but post-operative pain still remains as a significant problem, specifically in the day care settings.^[1] These patients usually complain of moderate intensity short duration pain.^[2] Up to 90% patient receive opioids for its treatment on the 1st post-operative day.^[3] There is high risk of nausea and vomiting after thyroid surgery,^[4] and uncontrolled pain can further exacerbate this problem. Opioids are the gold standard for post-operative pain. Due to their undesirable side effects such as nausea and vomiting, sedation and respiratory

depression, anaesthesia practice has evolved from 'opioid based' to 'opioid sparing' or more recently into 'opioid free anaesthesia.' This requires non-opioid analgesics and use of regional analgesia techniques. Acetaminophen is a non-opioid analgesic, which does not cause post-operative nausea and vomiting, sedation or respiratory depression. It is a drug of choice for the management of post-operative pain, especially after thyroidectomy.^[5] As part of multimodal analgesia regional blocks are gaining popularity in the management of post-operative pain after thyroidectomy.

A study of 162 patients who underwent thyroidectomy and received bilateral superficial cervical plexus block (BLSCP), pain score was much lower in the initial hours post-surgery that eventually leads to a shortened hospital stay. Meantime duration to keep patient pain free in Group A (general anaesthesia [GA] + standard analgesia

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along with isotonic saline for BLSCP) was 82.1 ± 61 min versus in Group B (GA + standard analgesia with 0.5% bupivacaine for BLSCP) was 360.8 ± 213.75 min.^[6] However, another similar study on 111 patients who were infiltrated with BLSCP either before commencement or the end of surgery as a regional block with 0.75% ropivacaine concluded that there was no improvement of post-operative pain score.^[7] Alternatively, BLSCP used in-patient undergoing carotid endarterectomy had improved analgesic efficacy as compared to combined (superficial and deep cervical plexus block) technique.^[8-9] Hence, information regarding the efficacy of BLSCPs in post-operative analgesia for thyroid surgery has been controversial, with some studies^[10] proving BLSCP to be effective while other studies^[11] finding no effect with the same.

Standard intravenous (IV) analgesia has not been established in literature; however, multimodal regimen currently used in our setup is comparable with other researches. These include a combination of opioids, non-steroidal anti-inflammatory drugs and acetaminophen. For this study, we defined standard analgesia as 'IV morphine 0.1 mg/kg + 15 mg/kg acetaminophen.' Since there are conflicting reports regarding the efficacy of BLSCP, we used standard analgesia in both groups. In this way, we did not deprive our patients the current standard of care at our institute.

The aim of this study was to compare the analgesic efficacy in terms of duration of pain-free period after the administration of BLSCP and standard analgesia with standard analgesia alone. The study outcome can help us to develop better analgesic modality for thyroidectomy patients. If proven to be efficacious, further studies may use cervical plexus block as a stand-alone technique or in combination with reduced number or dose of analgesics that we currently use as part of our standard regimen.

Objectives

The objective of the study is to compare the mean duration of patient's pain-free time in Group A (standard analgesia with BLSCP) versus in Group B (Standard analgesia without BLSCP) in patients undergoing thyroid cancer surgeries.

Operational definitions

Outcome variable was the patient's pain-free time. After the procedure, patients were shifted to post-anaesthesia care unit (PACU) where they were evaluated for post-operative pain using numeric pain rating score (10: The worst pain imaginable and 0: Pain free) at q 0, 30, 60, 90 and 120 min. When numeric rating score was $\geq 4/10$, pain was labeled and duration of pain-free time was recorded.

Bilateral superficial cervical plexus blocks

The cervical plexus is made up of the ventral rami of the first four spinal nerves, which further distribute in superficial or deep motor branches. The block was performed using 20 ml of 0.25% bupivacaine on each side of the neck along the dorsal edge of the sternocleidomastoid muscle.

Standard analgesia

Standard analgesic regimen used in this study was intravenous (0.1 mg/kg morphine and 15 mg/kg acetaminophen).

Hypothesis

There is a difference in the meantime duration to keep patient pain free in standard analgesia with BLSCP versus in patients with standard analgesics without BLSCP in-patient undergoing thyroid cancer surgeries under GA.

Materials and Methods

Study design

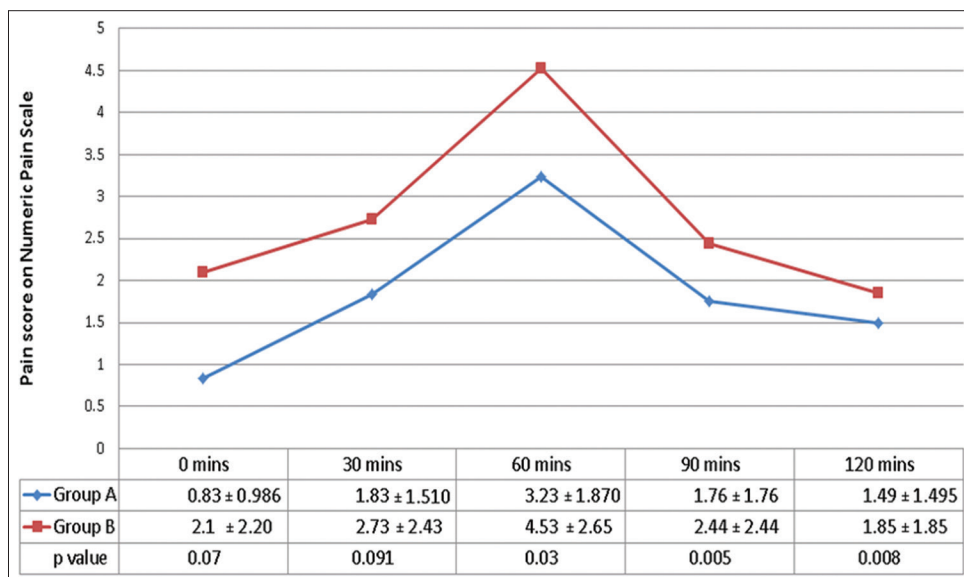
This was a prospective, observer-blinded randomised-controlled trial.

Setting

This study was conducted at the Department of Anaesthesia and Pain Medicine, Shaikat Khanum Memorial Cancer Hospital and Research Center, Lahore.

Duration of study

6 months. (From September 2017 to March 2018).



Graph 1: Mean pain score versus time intervals

Table 1: Demographics characters and duration of surgery

Patient demographics	BLSCP (n=30)	Control (n=30)
Age (years)	37.33±10	37.01±8
Weight (kg)	66±9	69±6
Male: Female (n)	3:7	2:8
Duration of surgery (min)	130±41	128±27

Table 2: Mean pain-free duration with P value

Age (year)	Groups	Pain-free duration		P value
		n	Mean±SD	
≤30	Group A	10	70±28.5	0.003
	Group B	10	49±23.6	
≥30	Group A	20	74±31.7	0.048
	Group B	20	57±37.0	

SD: Standard deviation

Sample size

Sample size of 60 patients (30 patients in each group) calculated based on the pioneer study^[10] with 95% confidence interval, 80% power of the test and expected meantime to keep the patient pain free. A difference pain-free duration of 130 min (standard deviation [SD]

45 ± 10) was observed in the reference study between the 2 groups.

Sampling technique

Non-probability Consecutive sampling.

Inclusion criteria

1. American Society of Anesthesiologists (ASA) I and II
2. Patients 20–60 years of age of either gender undergoing thyroidectomy for thyroid cancer.

Exclusion criteria

1. Patients refusal for intervention
2. Patient allergic to bupivacaine and opioids
3. Renal abnormality with (creatinine value >2.0)
4. Patients with a history of smoking, chronic narcotic use or alcohol abuse.

Data collection

After getting the approval from Hospital Ethics Committee, patients who met the inclusion criteria were randomly allocated to groups using random number table available online. Group A was patients receiving BLSCP, and Group B was patients not receiving BLSCP. Both groups received standard analgesia.

All patients were provided with patient information sheet, and written informed consent was obtained. The demographic information, ASA status, age and weight were noted. IV access was established in all patients, and vitals were checked before the induction. Patients were shifted to operating room, and ASA standard monitoring (electrocardiography, non-invasive blood pressure, heart rate and pulse oximetry) was applied. A standard anesthetic regimen was applied. Anaesthesia was induced with propofol 1–2 mg/kg and muscle relaxation with atracurium 0.5 mg/kg. Airway was secured by endotracheal tube. All patients were ventilated with volume controlled ventilation with a mixture of 50% oxygen and 50% air and 1.5–2.5% sevoflurane.

Standard analgesia (0.1 mg/kg morphine and 15 mg/kg acetaminophen for pain management) was given to the patients in both groups. Group A received standard analgesia and regional block (BLSCP) with 20 ml of 0.25% bupivacaine using 3 point injection technique, and the spread of local anaesthesia was visualised with the ultrasound machine before the commencement of surgery.

Group B received GA and standard analgesia without the regional block (BLSCP). All patients were administered IV fluid consisting of Ringer's lactate solution for maintenance according to patient's weight.

After the surgery, patients were shifted to the PACU. They were evaluated for pain using numeric pain rating score, at 0, 30, 60, 90 and 20 min after surgery. If the patient's pain score was higher than four, a rescue analgesia of diclofenac 75 mg was given. Pain-free period was recorded as per operational definition.

Statistical analysis

Statistical analysis was performed using SPSS version 22 for IBM (SPSS, Chicago, Illinois, USA). Quantitative variable was presented as mean \pm SD. Qualitative variables such as gender were presented as frequency and percentage. Both groups were compared by applying *t*-test. Assumptions for *t*-test (normality and equality of variance) were checked using graphical and statistical test. Post-stratification *t*-test was applied with $P < 0.05$ as statistically significant.

Results

Age distribution

Table 1 demonstrates demographic characteristic and duration of surgery. 10 (33.3%) patients in Group A were ≤ 30 years and 20 (66.6%) patients in Group B were more than 30 years of age. Similarly, 10 (33.3%) patients in Group A were more ≤ 30 years of age and 20 (66.6%) patients were more than 30 years of age in Group B. Mean age of the patients was 37.33 years in the Group A and 37.0 in Group B, the range being 18–60 years.

Gender distribution

Group A consisted of 21 female (60%) and 9 (30%) male patients. Group B consisted of 24 (80%) females and 6 (20%) males.

Mean pain-free duration (primary outcome)

The mean pain-free duration for the Group A was 72 min (± 30.1) compared to a mean free duration of 53 min (± 30.3) for Group B.

Patients whose age was ≤ 30 years in Group A had a mean pain-free duration of 70 min (± 28.5) as compared to Group B where mean pain-free duration was 49 min (± 23.6). Similarly, patients whose age was more than 30 years in Group A had a mean pain-free duration of 74 min (± 31.7) as compared to Group B where mean pain-free duration was 57 min (± 37). This shows a significant reduction in mean pain-free duration in Group A population [Table 2].

Mean pain score

Average NRS pain score in the Group A at q 0, 30, 60, 90 and 120 minutes was (0.83 \pm 0.986, 1.83 \pm 1.510, 3.23 \pm 1.870, 1.76 \pm 1.76 and 1.49 \pm 1.495), whereas the average NRS pain score in the Group B at q 0, 30, 60, 90 and 120 minutes was (2.1 \pm 2.20, 2.73 \pm 2.43, 4.53 \pm 2.65, 2.44 \pm 2.44 and 1.85 \pm 1.85) [Graph 1].

Discussion

Literature regarding the analgesic efficacy of bilateral BLSCP for post-operative analgesia after thyroidectomy remains inclusive. While some studies^[6,11] have found no

benefit for post-operative pain control with BLSCPSB, others advocated BLSCP B as a promising and effective analgesic modality in patients undergoing thyroidectomy.^[7] This study can be differentiated from other similar studies as this study included only thyroid carcinoma patients undergoing thyroidectomy.

The goal of this study was to compare the analgesic efficacy by calculating the mean pain-free duration of the BLSCP B group versus the control group. BLSCP B was performed immediately after the induction of GA using the three-point landmark technique and then visualising the spread of bupivacaine with an ultrasound machine. We used 0.25% bupivacaine with GA versus standard analgesia alone being used at our setup for post-operative pain management. There was significant difference in pain scores at all time intervals in our study. These results suggest that there is a considerable decrease in pain scores in the first 2 h after the surgery in the BLSCP B patient as compared to the standard analgesia alone group. It was also observed that fewer patients in Group A required rescue analgesic dose of 75 mg diclofenac as compared to the control group.

The choice of drug to be used in the cervical block is debatable, and various combinations are recommended in different studies. In the study by Andieu *et al.*, clonidine was used as an adjuvant with bupivacaine for regional anaesthesia, this lead to a significant decrease in peri-operative analgesic requirement in patients of BLSCP B group. Clonidine enhances pain relief after peripheral nerve block, acting through a central action due to systemic absorption and a direct action on local nerve fibres.^[12] We did not use clonidine as it is not available in our country.

In another study by Eti *et al.*,^[11] patients did not require additional analgesia for initial hours when BLSCP B was performed at the end of thyroidectomy; furthermore, 34% did not require opiates at all in the first 24 h after surgery.

Our results are comparable to available literature. This study shows that BLSCP B is an effective method of reducing post-operative pain after thyroidectomy. Post-operative pain was well controlled during the stay in PACU. Additional analgesia paracetamol was prescribed as the patient was discharged from PACU. This way the

use of opioid was minimised in the post-operative period and hence the associated side effects such as nausea and vomiting.

Meantime duration of pain-free period was longer in the BLSCP B patients, however it was shorter than what was expected. There could be two possible explanations. First, few patients had a previous thyroid surgery which could have distorted the anatomical planes of thyroid. This could alter the spread of the bupivacaine infiltrated in the region. Hence, these patients had a lesser pain satisfaction score, some of our patient population consisted of non-Urdu/English speaking group. We required a translator (usually an attendant) to translate the pain score. Language barrier and patient apprehension could have been a factor in undermining the pain score. Hence, this is considered as another limitation of the study.

The pain scores in Group B confirm that some patients experience moderate/severe pain (mean pain score >4 at 60 min) after surgery but for a short duration. Acetaminophen alone was insufficient, and rescue analgesic dose of diclofenac 75 mg was added in these patients. Hence, regional anaesthesia is an appropriate component of multimodal analgesia in this setting.

Conclusion

BLSCP B infiltrated after the induction of GA is effective method of reducing post-operative pain after thyroid cancer surgery. It also significantly decreases the severity of pain in the first 2 h after surgery. Further studies are required with larger sample size to establish the role of cervical plexus block as an effective modality for preventing post-operative pain after thyroid cancer surgeries.

Conflict of Interest

The authors declare that they have no conflict of interest.

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Authorship Contributions

Concept and design: HNN, AWK, AMS; Data Collection and interpretation: HNN; Literature review and writing: HNN, AMS; Manuscript approval HNN, AWK, AMS