ORIGINAL INVESTIGATION

Bilateral Superficial Cervical Plexus Block versus Infiltration Block in Thyroidectomy

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ABSTRACT

Objective: Efficient analgesia is required for the moderate-intensity pain arising in the thyroid surgery wound. **Study Design:** This study aimed at comparing the incision site infiltration block (IB) and bilateral superficial cervical plexus block (BSCPB). **Setting:** Of a total of 158 patients undergoing thyroidectomy, 80 were assigned to receive Group I and the remaining Group P. **Subjects and Methods:** Incision line infiltration was performed to Group I patients along with the incision line, while Group P patients received BSCPB, all with 10 mL of 0.5% levobupivacaine. The following were recorded: Hemodynamics parameters, the duration of post-anesthesia recovery score, post-operative pain scores, duration of the first analgesic needs, total dose of analgesics, and comfort score during an hour postoperatively. Patients were monitored for the presence of hoarseness, dyspnea, low oxygen saturation, and Horner syndrome. **Results:** The duration of analgesia was higher with statistical significance ($P = 0.0001$) in Group P, while no significant difference was noted between the groups with regard to 24-h post-operative analgesic use ($P > 0.05$). Patient comfort score was significantly higher in Group P ($P = 0.02$). Verbal rating scores at post-operative 5, 10, 30, 45, 60, 75, and 90 min were significantly higher in Group I than in Group P ($P < 0.05$). **Conclusion:** A longer post-operative analgesia duration, lower verbal rating scale score, and better patient comfort score were observed following thyroidectomy in patients given BSCPB compared with those who had undergone IB.

Key words: Infiltrative block, levobupivacaine, post-operative analgesia, superficial cervical plexus block, thyroidectomy

INTRODUCTION

Efficient analgesia is required for the moderate-intensity pain arising in the thyroid surgery wound.[1-4] A study by Gozal *et al*.[4] recorded a mean post-operative pain score of 6.9 on the visual analog scale (VAS) (from 0 = no pain to 10 = most intense pain); 90% of the patients needed post-operative opioid treatment. Furthermore, post-operative nausea and vomiting are observed more frequently in thyroidectomy patients compared with other surgical patients.[5]

While nonsteroidal anti-inflammatory agents may be used to reduce post-operative pain, many surgeons do not favor them due to worries about bleeding complications.[6]

The regional anesthesia techniques are being used with increasing frequency, with the intent of avoiding the adverse effects of systemic drugs and increasing the duration of analgesia.[1,2,6-8]

This study aimed to compare the incision site infiltration block (IB) with the bilateral superficial cervical plexus block (BSCPB), both used to prevent early post-operative incision wound pain with regard to the following parameters: Duration of post-operative analgesia, the verbal rating scale (VRS) score, the experienced pain level, the duration of the first analgesia need (at VRS >3), the total dose of analgesia used in the first post-operative 24 h (mg of diclofenac sodium), and post-operative patients' comfort.[9] The two study groups were also compared for their hemodynamics (tachycardia/bradycardia and hypertension/hypotension), surgery duration, patient's waking time, duration of Aldrete post-anesthesia recovery score >8, post-operative hoarseness, dyspnea, loss of oxygen saturation (SpO_2 <90%), and

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presence of Horner syndrome (classic triad of ptosis, miosis, and anhidrosis).[10]

MATERIALS AND METHODS

After obtaining approval from the Gaziantep University Ethical Committee, 158 patients were included in the study. The elective total thyroidectomy operations were performed between the years 2011 and 2013. All patients underwent the same standard surgical procedure. The work presented here was performed in accordance with the most recent version of the Helsinki Declaration.

The 158 patients aged 18–84 years were scheduled for elective thyroidectomy by the same surgeon; all had an American Society of Anesthesiologists Physical Status Class I or II. Exclusion criteria were as follows: Recent use of opioids or any analgesic agent, history of previous thyroid or parathyroid surgery, presence of any condition entailing intolerance, allergy, or contraindication to the medications used in the study, renal, pulmonary, cardiac, or hepatic dysfunction, pregnancy, absence of euthyroidism, incapacity to understand the treatment protocol or the patient information form, or refusal of consent. All patients provided written informed consent to participate in the study.

Treatment allocation was randomized for a computerized name list. A random number list was used to determine which of the following two groups, each patient was to be allocated: Group P, to receive BSCPB, or Group I, to undergo infiltrative block.

All patients were taken to the operating room following premedication with midazolam 0.07 mg/kg (Demizolam®, Dem Medikal, Istanbul, Turkey). The skin markings for the cervical incision were made by the surgeon before moving the patient to the operating room. The patients were intubated following induction of general anesthesia with propofol 2.5 mg/kg (Propofol 1%, Fresenius Kabi, Hamburg, Germany) and rocuronium bromide 0.5 mg/kg (Esmeron®, Organon, Oss, The Netherlands). Anesthesia was maintained with a mixture of 50% oxygen and 50% N_2O with the addition of 1% isoflurane (Forane®, Abbott, IL, USA). Following endotracheal intubation, Group I patients underwent infiltration of 10 mL of 0.5% levobupivacaine along the incision line. The same anesthetist performed a BSCPB with 0.5% levobupivacaine, 5 mL on each side subcutaneously, starting about the middle of the clavicular branch of the sternocleidomastoid muscle, which extends from the mastoid to the clavicle, immediately behind the posterior edge of the muscle, and moving toward the clavicle. The subcutaneous infiltration in Group I patients followed the surgical incision line, marked before the start of surgery. The total amount of local anesthesia agent was used in both the groups; infiltrations were all performed with a 22-gauge needle.

The patients were administered diclofenac sodium (Dikloron® 75 mg/3 mL; Deva, Istanbul, Turkey), 75 mg intramuscularly (IM) when their VRS pain score was >3 for post-operative pain management.

The primary outcome parameter was the post-operative VRS pain score. The secondary outcome measures were the post-operative analgesic use and patient comfort. The VRS score was determined by asking the patient for the presence or absence of pain and its intensity, over a scale from 0 to 5 as follows: 0, no pain; 1, mild pain; 2, moderate pain in the absence of analgesic need; 3, moderate pain in the presence of analgesic need; 4, severe pain; and 5, excruciating pain.

The time to awakening was evaluated by the Aldrete recovery score. The time during which the Aldrete recovery score was >8 was recorded. Post-operative VRS evaluations were performed at 5, 10, 30, 45, 60, 75, and 90 min in the recovery room; post-operative analgesia duration was defined as the time elapsed from extubation to the first need for anesthetic administration (VRS >3). These values continued to be evaluated by questioning and recorded every hour during the first 24 h. The time of administration of the first analgesic dose was communicated to the study team by the nurse on duty. Intraoperative hemodynamic parameters (tachycardia, bradycardia, hypertension, and hypotension) were recorded during observation. Changes by 20% or more in hemodynamics parameters (mean blood pressure and heart rate) between baseline and intubation, surgical incision, or extubation were additionally recorded as significant events. The patients' comfort was evaluated by the following scale: 4, excellent; 3, good; 2, fair; and 1, poor. The duration of the first analgesia (as long as pain score by VRS remained >3) was also recorded. The cumulative dose in mg of diclofenac sodium in the first post-operative 24 h was evaluated to express the analgesia need. The evaluations were performed by an anesthetist who had no information on the patients assigned group or the kind of operation. As a result, the present prospective study was randomized and double blinded.

The team involved in data collection, including nurses, anesthesia technicians, and physicians, was trained for the operations by the investigators. Post-operative complications (hoarseness, Horner syndrome, and dyspnea) were also noted.

Statistical analysis

The data were analyzed using the SPSS software package (version 15.0, SPSS Inc., IL, USA). Continuous data (mean blood pressure, heart rate, operation duration, time to awakening, time with Aldrete score >8, first analgesia duration, and cumulative post-operative analgesia dose in the first 24 h) were compared between groups by Student's *t*-test and described by their mean ± standard deviation. Categorical variables (VRS, post-operative patient comfort score)

were described by their median and range. Complications (hoarseness, Horner syndrome, and dyspnea) were expressed as number (%).

Fisher's exact test, Mann–Whitney U-test, or Wilcoxon rank-sum test were used as appropriate to compare the categorical/nominal variables. $P < 0.05$ was accepted as statistically significant.

RESULTS

Demographic data (age, sex, and body mass index) comparison between the two groups did not identify significant differences ($P > 0.05$) [Table 1]. Similarly, no significant difference could be identified between the groups with regard to hemodynamic events at baseline, intubation, incision, and extubation (tachycardia, bradycardia, hypertension, and hypotension) ($P > 0.05$) [Table 2].

The post-operative complications were noted; Group P patients experienced hoarseness in 4 (5%) cases, Horner syndrome in 2 (3%), and dyspnea in 1 (1%) patient; the respective frequencies in Group I were 5 (6%), 1 (1%), and 4 (5%). No statistically significant difference was detected between the groups ($P > 0.05$) [Table 3].

Operation duration and the duration of >8 Aldrete post-operative recovery score were similarly without detectable statistical difference ($P > 0.05$) [Table 4]. VRS scores at post-operative 5, 10, 30, 45, 60, 90, and 90 min were significantly higher in Group I than in Group P ($P < 0.05$) [Figure 1]. The patient comfort score at post-operative 1 h was significantly higher in Group P ($P = 0.02$) compared to Group I [Table 4]. The post-operative analgesia durations were 10.2 ± 4.0 h in Group P and 7.9 ± 3.7 h in Group I ($P = 0.0001$) [Table 4]. No difference could be established with respect to the cumulative 24-h post-operative analgesia dose as mg diclofenac sodium ($P > 0.05$) [Table 4].

DISCUSSION

A longer post-operative analgesia duration, lower VRS score, and better patient comfort score were observed following thyroidectomy in patients performed BSCPB compared with those who had undergone IB. No significant difference could be established in the cumulative 24-h post-operative analgesia dose.

Table 1: The demographic data of the groups

Groups	Group N (*n*=80)	Group B (*n*=78)	*P*
Age (years)	46.5±13.5	46.8±13.6	0.9
BMI (kg/m^2)	29.0±3.2	30.1±3.4	0.07
Gender (M/F) (*n*)	19/61	26/32	0.1

P>0.05 when compared to the groups. The data were expressed as mean±standard deviation

Table 2: The hemodynamic side effects during anesthesia

Groups	Group N (*n*=80) (%)	Group B (*n*=78) (%)	*P*
Tachycardia (T)			
T-baseline	23 (29)	19 (24)	0.4
T-intubation	40 (50)	29 (36)	0.5
T-incision	18 (23)	16 (21)	0.4
T-extubation	35 (44)	30 (38)	0.5
Bradycardia (B)			
B-baseline	0 (0)	1 (1)	0.2
B-intubation	4 (5)	4 (5)	0.2
B-incision	1 (1)	6 (8)	0.2
B-extubation	0 (0)	0 (0)	0.4
Hypotension (Ho)			
Ho-baseline	4 (5)	3 (4)	0.2
Ho-intubation	5 (6)	7 (9)	0.3
Ho-incision	3 (4)	8 (10)	0.3
Ho-extubation	0 (0)	1 (1)	0.2
Hypertension (Ht)			
Ht-baseline	17 (21)	12 (15)	0.4
Ht-intubation	35 (44)	18 (23)	0.5
Ht-incision	14 (18)	12 (15)	0.4
Ht-extubation	38 (48)	23 (29)	0.5

P>0.05 when compared to the groups. The data were expressed as *n* (%)

Table 3: The side effects after anesthesia

Groups	Group N (*n*=80) (%)	Group B (*n*=78) (%)	*P*
Hoarse	5 (6)	4 (5)	0.7
Horner syndrome	1 (1)	2 (3)	0.5
Dyspnea	4(5)	1 (1)	0.1

P>0.05 when compared to the groups. The data were expressed as *n* (%)

Table 4: The duration of operation, Aldrete >8, post-operative analgesia, and post-operative comfort scale of the groups

Groups	Group N (*n*=80)	Group B (*n*=78)	*P*
The duration (D) of operation (min)	170.0 (90.0–270.0)	150.0 (60.0–390.0	0.2
The D Aldrete >8 (min)	8.0 (0.0–18.0)	7.0 (0.0–26.0)	0.3
The D of post-operative (PO) analgesia (h)	7.9±3.7	10.2±4.0	0.0001*
Patients' comfort scale at the PO 1st h	3.0 (2.0–4.0)	3.0 (1.0–8.0)	0.02*
The consumption of analgesic in post-operative 24-h period (mg)	14.0±29.4	12.5±28.1	0.7

**P*< 0.05 when compared to the groups. The data were expressed as mean±standard deviation or median (min-max)

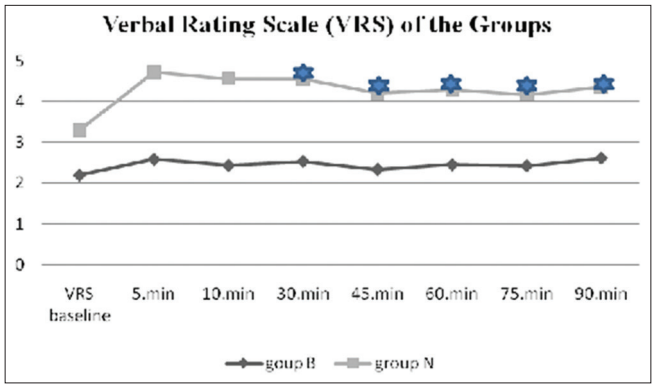

Figure 1: The post-operative verbal rating scale of the groups. **P* < 0.05 when compared the groups. n_N = 80, n_B = 78

BSCBP or a combined bilateral and deep cervical plexus block is used in addition to general anesthesia in thyroid surgery. Regional anesthesia combined with potent analgesia may lead to reductions in stress response, need for systemic analgesia, opioid-related side effects.[11]

BSCPB is a much-studied technique in patients undergoing thyroid surgery.[1,2,6-8,12,13] Different studies have been published on BSCPB in patients undergoing thyroid and parathyroid surgery. Herbland *et al*.[14] studied 111 thyroidectomy patients, categorized into three treatment groups, applying pre-operative BSCBP under general anesthesia to the first, the same treatment under general anesthesia postoperatively to the second, and no nerve block at all to the third. The local anesthesia agent was 0.75% ropivacaine. Neither the pre-operative nor the post-operative BSCPB reduced opioid use or pain measurements in 36 h after the operation. Andrieu *et al*.[15] also published a study of three groups of patients, comparing, in thyroid surgery patients, the anesthetic effect of a BSCBP performed with normal saline to ropivacaine 0.487% or to the latter drug together with clonidine 5 μg^{-1}. BSCPB with 0.487% ropivacaine, with or without clonidine, was found to be effective in reducing analgesic need following thyroid surgery. In the present study, patients were administered diclofenac sodium (Dikloron® 75 mg/3 mL; Deva, Istanbul, Turkey), 75 mg IM, when their VRS pain score was >3. No difference could be established with respect to the cumulative 24-h post-operative analgesia dose as mg diclofenac sodium.

A recent meta-analysis by Warschkow *et al*.[12] has reviewed the effects of BSCPB under general anesthesia. Eight randomized, controlled studies comprising 799 patients (463 with supraclavicular brachial plexus block [SCBPB] and 336 controls) were included in this meta-analysis. The evaluation of the entire set of data showed an important reduction in pain scores in post-operative 6–24 h. The effect on pain, however, was only very weakly correlated with the clinical data. In the present study, the post-operative analgesia duration was 12.2 ± 4.0 h in the group receiving BSCBP and 7.9 ± 3.7 h in patients undergoing IB. This difference in the duration of analgesia was significant.

Peripheral nerve blocks reduce the incidence of nausea and the post-anesthesia unit stay, while increasing patient satisfaction.[16] Lo Gerfo[17] reported that patients who underwent thyroidectomy under locoregional anesthesia showed low morbidity and high satisfaction. This contrasts with Mamede and Raful.[18] who compared patients subjected to partial thyroidectomy under general anesthesia to those who had the operation performed under SCBPB following meperidine-promethazine sedation, with a total patient number of 42. No significant difference was noted between the groups with respect to patient satisfaction. Suri *et al*.[19] compared 64 patients undergoing thyroid or parathyroid

surgery under general anesthesia to 31 patients who had sedation with SCBPB. Patients in both the groups were very satisfied with the anesthesia method. The study compared SCBPB to IB and found higher post-operative patient comfort in the SCBPB group.

A literature search yielded few data on the relationship between SCBPB and intraoperative hemodynamic parameters. In the comparison of SCBPB and general anesthesia patients of Mamede and Raful,[18] the incidence of bradycardia was statistically significantly higher with SCBPB. Luchetti *et al*.,[20] in a 28-patient study, compared patients undergoing carotid endarterectomy with a superficial cervical plexus block to a superficial cervical plexus block together with general anesthesia. The mean arterial pressure (MAP) was higher in the patients who had a superficial cervical plexus block only. Ivanec *et al*.,[21] comparing superficial cervical plexus block to combined superficial and deep cervical plexus block in two groups of patients, failed to identify a statistically significant difference in hemodynamic parameters other than heart rate (systolic and diastolic blood pressure and MAP). The heart rate was slightly more elevated in the group with a combined block than in the group with the superficial block only (88 vs. 83 min^{-1}, respectively). This elevation was attributed to the vagal block occurring in the course of the deep blockade. No statistically significant differences could be evidenced between the groups in the present study with regard to intraoperative hemodynamic events (tachycardia, bradycardia, hypertension, or hypotension). The use of local-regional methods in both the groups may explain the absence of such significant differences.

It can be observed that deep cervical plexus block was performed alongside BSCPB, aiming to provide both intraoperative anesthesia and post-operative analgesia.[22-24] The publications reporting the addition of deep cervical plexus block to the superficial block provide conflicting data. Aunac *et al*.[23] reported that the combination of deep cervical plexus block and superficial cervical plexus block was an efficient technique for reducing opioid need during thyroid surgery and in the post-operative period. Suh *et al*.,[22] on the other hand, indicated that the use of the superficial cervical plexus block by itself was more efficient in reducing pain during and immediately after thyroidectomy than its combination with the deep cervical plexus block. Similarly, Pintaric *et al*.[25] compared BSCPB to its combination with the deep cervical plexus block in patients undergoing minimally invasive thyroid surgery. They concluded that the addition of the deep cervical plexus block to BSCPB did not increase the efficacy or success, providing similar intraoperative analgesia use and post-operative patient satisfaction. Furthermore, an increasing risk, with deep cervical plexus block, of serious complications was reported (such as intrathecal injection, respiratory problems due to phrenic nerve palsy, and local anesthetic toxicity).[26] Although the possibility of adding a deep cervical block to the method used in the present study existed, it was avoided considering the controversial data published, the complications of deep injection, and the minimally invasive procedure desired in this study.

A recent study by Egan *et al*.[2] showed that BSCPB reduced pain scores and opioid consumption in the period following thyroid and parathyroid surgery. One group in this study received local anesthetic infiltration in the incision, and the other received the same treatment combined with BSCPB. In the present study, infiltrative anesthesia alone was compared to BSCPB, which makes the method less invasive. While the study by Egan *et al*. was performed on a total of 58 patients, the present study included 158 patients. Furthermore, differences were noted between the two studies with respect to the anesthetic agents. The present study used 10 mL of 0.5% levobupivacaine; Egan *et al*. injected bupivacaine in the same volume and concentration. Bupivacaine was shown in few studies to carry a higher risk of cardiotoxicity and CNS toxicity.[27-30] The method used in the present study thus seems to be safer as far as local anesthetic toxicity is concerned. The study by Egan *et al*. concluded that BSCPB reduces post-operative analgesic dose and pain scores. The present study obtained similarly reduced pain scores, while post-operative analgesic agent consumption between the groups failed to show statistical significance.

CONCLUSION

In conclusion, a longer post-operative analgesia duration, lower VRS score, and better patient comfort score were observed following thyroidectomy in patients given BSCPB compared with those who had undergone IB.

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