Control of Post-Thyroidectomy Pain: A Comparison between Local Wound Infiltration and Bilateral Superficial Cervical Plexus Block.

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Abstract:

Background: Regional anesthesia for post-thyroidectomy pain management has recently become as a new trend that provides a good quality of analgesia with more prolonged duration and lesser side effects than IV analgesia.

Aim of the study: We aimed to assess the bilateral superficial cervical plexus block (BSCB) versus local wound infiltration (LWI) after thyroid surgery with regard to postoperative analgesic efficacy.

Patients & Methods: Sixty adult patients of both sexes scheduled for elective thyroid surgery were randomly categorized into three equal groups. In the first group no regional block was performed (group-C), in the second group (group-L) the wound was infiltrated with 0.5% bupivacaine at the end of surgery, and the third group (group-B) received BSCB immediately after the induction of general anesthesia. Pain intensity was evaluated by the eleven-category numerical rating scale (NRS) and the four-category verbal rating scale (VRS) at the first hour after surgery, and then every 4 hours for the 24 hours postoperatively.

Results: NRS and VRS mean scores were significantly lower in groups (L) and (B) compared with the (C) group. The mean (± SD) of postoperative NRS scores was 3.82 (± 0.65), 2.01 (± 0.61), and 1.36 (± 0.70) in the (C), (L), and (B) groups respectively. The corresponding values measured by VRS were 2.49 (± 0.20), 1.71 (± 0.22), and 1.55 (± 0.23).

Conclusion: Although both techniques are effective for post-thyroidectomy pain management during the first postoperative 24 hours, BSCB provides a better analgesia and effectively decreases postoperative pethidine consumption more than LWI.

Introduction:

Post-thyroidectomy acute pain should be controlled especially during the first post-operative day.[1] Many surgeons are reluctant to use non steroidal anti-inflammatory drugs soon after this type of surgery because of fear of bleeding complications.[2] Also, opioids are not a good choice as they may promote postoperative nausea and vomiting, which are already frequent after this type of surgery.[3,4] Therefore, regional anesthesia for thyroid surgery has recently become as a new trend that provides a good quality of postoperative analgesia with more prolonged duration and lesser incidence of side effects. Other advantages of regional anesthesia include its sparing effect on the intra- and postoperative analgesic requirements, and lightening of the level of general anesthesia.[5, 6]

Superficial, deep or combined superficial and deep bilateral cervical plexus blocks have all been used to decrease the postoperative pain and opioid requirements after neck surgery.[5-7] However, deep cervical plexus blocks is associated with many complications including hemi-diaphragmatic dysfunction.[8]

Local wound infiltration (LWI) with local anesthetics (LA) is a simple and safe alternative approach for postoperative pain relief. It has been used in different types of surgery, and found to be more efficient in superficial and minor short-lasting procedures,[9, 10] than major visceral operations.[11, 12]

The aim of this study was to assess the bilateral superficial cervical plexus block (BSCB) versus LWI after thyroid surgery with regard to postoperative analgesic efficacy.

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Patients and Methods:

This study was carried out on 60 adult patients of both sexes undergoing elective thyroid surgery. Only euthyroid patients with physical status of ASA-I or ASA-II were included in the study. An informed consent was taken from every patient representing his approval of the study. Exclusion criteria included huge goiter, recent use of analgesics or steroids, history of allergy to LA, patient with coagulopathy or receiving anticoagulants, and patients who were unstable, psychiatric or unable to use numerical rating scale (NRS) or four-category verbal rating scale (VRS) for pain assessment.

Patients were randomly categorized into three equal groups, each group included 20 patients. The first group received no regional block (control or group-C), in the second group LWI was administered at the end of surgery (group-L), and in the third group BSCB was performed immediately after induction of general anesthesia (group-B).

All patients were premedicated with IV midazolam (0.03-0.05 mg/kg within an hour (hr) preoperatively).

On arrival to the operating room all patients were connected to a multi-channel monitor for continuous display of ECG, heart rate, non-invasive blood pressure and peripheral oxygen saturation. Anesthesia was induced with IV fentanyl (3-4 µg/kg) and IV propofol (2–3 mg/kg). Endotracheal intubation was facilitated by the administration of IV atracurium (0.5 mg/kg). Anesthesia was maintained by 50% of nitrous oxide in oxygen, with halothane (0.4–0.8%). Supplemental atracurium (0.15 mg/kg) was given every 15 to 25 min.

After induction of general anesthesia, and after local sterilization, the superficial block of cervical plexus was performed bilaterally by injecting 15 ml of 0.5% R-bupivacaine (Laboratoire Delmas, Lyon-France) just subcutaneously at each side using a 23-gauge needle, which was inserted at the midpoint of the posterior border of the sternocleidomastoid muscle in three directions; 5 ml were injected up (cephalic) and 5 ml down (caudad) along the posterior border of the sternocleidomastoid, and 5 ml were injected horizontally above the muscle.

Local infiltration of the wound was performed by the surgeon at the end of surgery just before wound closure. A 23-gauge needle was inserted along the incision line and 20 ml of 0.5% R-bupivacaine (Laboratoire Delmas, Lyon-France) were infiltrated in the subcutaneous layers. Redivac surgical drain of size 10 or 12 was inserted in all patients.

Postoperatively, all patients were transferred to the post-anesthetic care unit (PACU) where they stayed for at least 1 hr, and then they were transferred to the ward.

Pain assessment was done postoperatively on the first hr, and then every 4 hrs until 24 hrs after the end of surgery. Pain intensity was evaluated by the eleven-category NRS (with 0 representing no pain and 10 representing the worst imaginable pain) and by the four-category VRS (no pain (I), mild pain (II), moderate pain (III), and severe pain (IV)).

Postoperative pain management was standardized in all groups by giving 50 mg of pethidine intramuscularly if the NRS score was ≥ 4 or VRS ≥ 3.

Prophylactic antiemetics (metoclopramide) were not administered.

Postoperative pethidine consumption, nausea, vomiting, and metoclopramide requirements were fully recorded during the first postoperative 24 hrs.

Values are presented as mean ± standard deviation (SD). One way ANOVA test was used for normally distributed variables, and the Bonferroni post-hoc test was used for multiple comparisons to determine the significance of differences in means. Kruskal-Wallis ANOVA was used for non-normally distributed data. $P<0.05$ was considered statistically significant.

Results:

Demographic characteristics and surgical data were comparable ($P>0.05$) in all groups (Tables 1).

During the first postoperative 24 hrs, NRS mean scores were significantly lower in groups (L) ($P<0.05$) and (B) ($P<0.001$) compared with the control (C) group (Figure 1).

The corresponding VRS scores were also significantly lower ($P<0.001$) in groups (L) and (B) than the control group (Figure 2).

By measuring the differences between (C) and (L) groups at each interval, the NRS pain scores were only significantly different at 1^{st}, 4^{th}, 8^{th} ($P<0.001$), and 12^{th} ($P<0.05$) intervals, whereas the significant differences between the (C) and (B) groups were at the 1^{st}, 4^{th}, 8^{th}, 12^{th}, 16^{th} ($P<0.001$), and 20^{th} ($P<0.05$) intervals, (Figure 1).

Table-1: Demographic characteristics and surgical data of patients in the three studied groups.

	Group (C)	*Group (L)*	*Group (B)*	*P* value
Age (years):	38.9 ± 12.6	35.4 ± 10.7	33.7 ± 9.2	0.321
Weight (kg):	73.1 ± 12.1	72.7 ± 113.	69.5 ± 11.6	0.564
Height (cm):	167.2 ± 4.97	167.8 ± 3.69	168.8 ± 5.68	0.587
Gender: M/F	2/18	1/19	2/18	--
ASA I/II:	15/5	15/5	14/6	--
Duration of surgery (min):	88.3 ± 30.6	80.45 ± 28.9	84.6 ± 35.6	0.742
Unilateral/bilateral lobectomy:	3/17	3/17	2/18	--

Values are expressed as total numbers or mean ± SD.

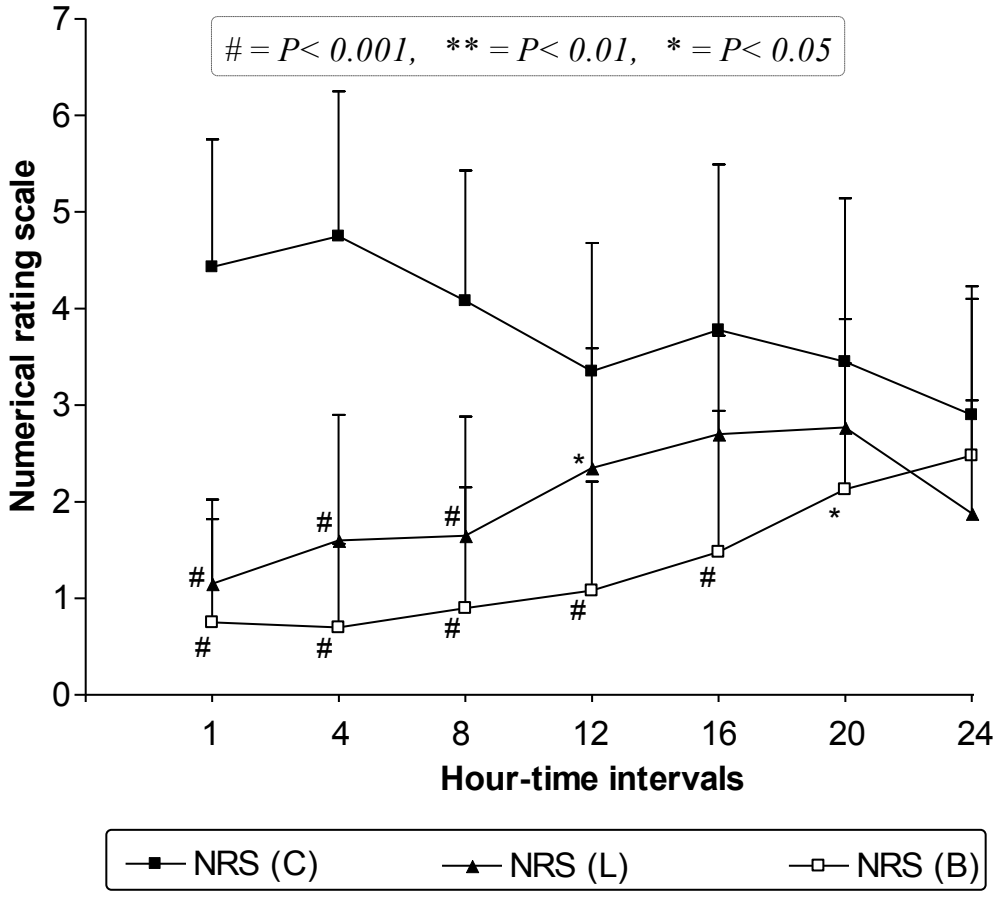


Figure-1: Mean numerical rating scale (NRS) pain scores in the control (C), local wound infiltration (L) and bilateral superficial cervical plexus (B) groups during the first 24 hours after surgery. Vertical bars are standard deviation. Pain scores were significantly lower in (L) and (B) groups when compared with (C) group.

Using the VRS, the inter-interval significant differences in pain scores between (C) and (L) groups were at the 1st, 4th, 8th (P<0.001), 12th, 16th, and 20th (P<0.01) intervals, whereas the significant differences between the (C) and (B) groups were at all the studied intervals [1st, 4th, 8th, 12th, 16th (P<0.001), 20th (P<0.01), and 24th (P<0.05)], (Figure 2).

The mean (±SD) of postoperative pain scores using the NRS was 3.82 (± 0.65), 2.01 (± 0.61), and 1.36 (± 0.70) in the (C), (L), and (B) groups respectively. The corresponding values measured by VRS were 2.49 (± 0.20), 1.71 (± 0.22), and 1.55 (± 0.23).

The proportion of patients with a NRS score ≥ 4 at any time-interval was significantly smaller

in the (L) (P<0.05) and (B) groups (P<0.01) when compared with the control group (Table 2).

The categorical VRS occasions at which patients reporting no, mild, moderate, and/or severe pain at any time are presented table 3. Severe pain was completely abolished in the treatment groups.

Number of patients required postoperative pethidine, and the total amount of pethidine consumption were significantly smaller (P<0.001) in the (L) and (B) groups than the (C) group. The time to first analgesic requirement was also significantly longer (P<0.001) in group (L) and (B) than for the control group (Table 4).

Regarding the incidence of postoperative nausea and vomiting, and the number of patients received metoclopramide, no significant statistical differences between the groups were found. Postoperative nausea was experienced by 11 (55%), 6 (30), and 5 (25%) patients (P= 0.144), and vomiting by 8 (40%), 4 (20%), and 3 (15%) patients (P= 0.16) in the (C), (L), and (B) groups respectively. Metoclopramide was given to 10 (50%), 4 (20%), and 3 (15%) patients of the corresponding groups (P= 0.091).

No related complications were reported in our studied patients.

Table-2: Number (and percentage) of patients with NRS ≥ 4 at all studied intervals.

	Group (C)	*Group (L)*	*Group (B)*
1 hr	14 (70%)	0 ***	0 ***
4 hr	15 (75%)	2 (10%) ***	0 ***
8 hr	11 (55%)	1 (5%) ***	1 (5%) ***
12 hr	8 (40%)	2 (10%) **	0 ***
16 hr	10 (50%)	7 (35%)	2 (10%) **
20 hr	8 (40%)	4 (20%) *	2 (10%) **
24 hr	5 (25%)	1 (5%) *	3 (15%)

The statistical differences between the control (C) and the treatment (L) and (B) groups are indicated by small stars when they are significant (= (P<0.05), ** = (P< 0.01), and *** = (P< 0.001)).*

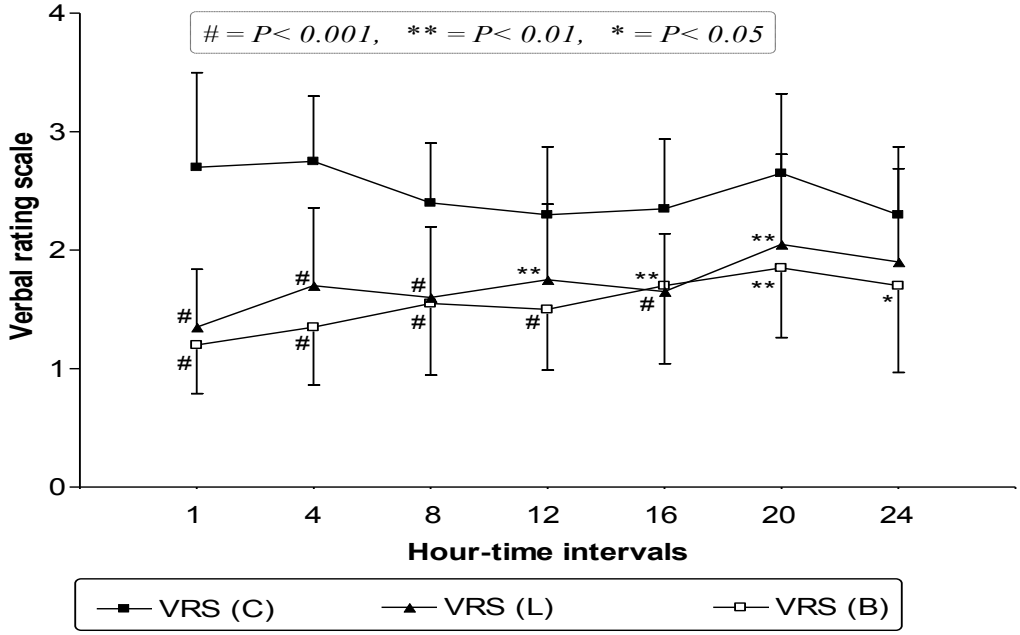


Figure-2: Mean verbal rating scale (VRS) pain scores in the control (C), local wound infiltration (L) and bilateral superficial cervical plexus (B) groups during the first 24 hours after surgery. Vertical bars are standard deviation. Pain scores were significantly lower in (L) and (B) groups when compared with (C) group.

Table-3: Sum (and percentage) of pain occasions for each categorical VRS measured at all studied intervals.

	Group (C)	*Group (L)*	*Group (B)*
No pain (grade I)	2 (1.4 %)	56 (40 %)	65 (46.4 %)
Mild pain (grade II)	76 (54 %)	68 (48.5%)	67 (47.8 %)
Moderate pain (grade III)	54 (38.5 %)	16 (10.7 %)	8 (5.7 %)
Severe pain (grade IV)	8 (5.7 %)	0 %	0 %

Severe pain was completely abolished in group (L) and group (B).

Table-4: Total number (%) of patients required analgesia, total (± SD) pethedine consumption, and first analgesia requirement time (± SD).

	Group (C)	*Group (L)*	*Group (B)*
Number of patients required analgesia:	15 (75%)	7 (35%) **	4 (20%) ***
Time to first analgesia (min):	162 ± 124	544 ± 320 **	860 ± 59 ***
Total pethedine doses (mg):	60 ± 44.7	20 ± 29.9 **	12.5 ± 27.5 ***

*The degree of significance of statistical differences between the control (C) and the treatment (L) and (B) groups are indicated by small stars (** = (P< 0.01), and *** = (P< 0.001)).*

Discussion:

The main outcome of this study was that the severity of post-thyroidectomy pain can be decreased similarly by either LWI or BSCB, although BSCB was more efficient. Accordingly, fewer patients in the treatment groups required postoperative pethidine, which was also consumed in smaller doses and administered after a more prolonged time.

Gozal *et al*.[9] studied the effectiveness of LWI after thyroid surgery, and reported that wound infiltration with 10 ml of 0.5% bupivacaine at the end of thyroid surgery markedly reduced the mean pain scores and the postoperative opioid requirements during the first postoperative 24 hrs. Similar results were obtained by another study using 12 ml of either ropivacaine or ropivacaine mixed with lornoxicam for wound infiltration after thyroid surgery.[13]

However, some literatures disputed the beneficial effect of LWI after thyroid surgery. In one of these studies LWI was performed with 20 ml of 0.25 % bupivacaine and found to be ineffective in decreasing neither opioids requirements nor pain scores.[14] In another study, bupivacaine wound infiltration effectiveness was considered disappointing when compared with two opioid regimens.[4]

The differences in study design, pain assessment, perception and management, and many other factors, all may interact and produce a wide range of discrepancy in the results of the different studies.[15-17] In many previous researches, and because the neck is a highly vascular area, 0.25%-0.375% bupivacaine was used to avoid side effects like systemic toxicity.[1,14] In the current study, higher doses of 0.5% bupivacaine were used for LWI (20 ml) and BSCB (30 ml) for the sake of prolonged analgesia, and no complications were observed during the study period.

The results of this study are consisted with that of Dieudonne et al.[1] who reported that BSCB can reduce pain intensity scores and the amount of cumulative opioid doses after thyroidectomy. They performed BSCB with 20 ml bupivacaine 0.25% with 1:200,000 epinephrine at the end of surgery and found lower pain intensity scores in the early postoperative period in the treatment group. However, a study by Eti, et al.[14] could not demonstrate any beneficial effect of BSCB on postoperative opioid demand or pain scores although they used a large volume (30 ml) of 0.25% bupivacaine.

In the current study, post-thyroidectomy pain could not be completely abolished in the treatment groups as 11 (27%) patients (7 patients in (L) and 4 patients in (B) group), required additional postoperative pethidine analgesia (Tab -4). Dieudonne et al.[1] concluded that BSCB alone can not provide optimal pain relief because still 65% of patients needed additional analgesics. This is probably due to the fact that the source of this type of pain has many components linked to the intraoperative neck position, superficial and deep layers of the wound, and wound drainage.[8,16,18,19]

NRS rather than VAS was chosen in this study to measure pain intensity, because previous studies evaluating the suitability of several pain

intensity scales in this type of surgery, reported that NRS to be convenient in the early postoperative period more than VAS.[17,20,21] VRS was chosen mainly because of its simplicity to all categories of patients.[16,18,21]

The duration of postoperative effective (statistically significant) analgesia in the (L) and (B) groups when evaluated by the NRS was 12 and 20 hrs respectively. The corresponding values when measured by the VRS were 20 and 24 hrs. This variation could be related to VRS per se, which frequently being described to be noncontiguous and less precise.[16,18] The current study did not evaluate the VRS, as this was beyond the scope of the study. However VRS was actually easier to all patients to understand, and generally it followed the trend of changes of pain scores measured by the NRS.

Although there were no significant statistical differences between the groups regarding the incidence of postoperative nausea and vomiting, it seems that the reduced pethidine consumption was clinically relevant, and had an impact on decreasing the incidence of postoperative nausea and vomiting in (L) (30%) and (B) (25%) groups when compared to the control group (55%). This is not in accordance with the study of Dieudonne et al.[1] who reported that the reduced morphine consumption in their studied groups was less clinically relevant, as it did not result in reduced incidence of postoperative nausea and vomiting.

Conclusion:

Although both techniques are effective for post-thyroidectomy pain management during the first postoperative 24 hrs, BSCB provides a better analgesia and effectively decreases postoperative pethidine consumption more than LWI.

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