

TWO DIFFERENT APPROACHES FOR PREVENTION OF POST-THYROIDECTOMY PAIN: LOCAL WOUND INFILTRATION VERSUS BILATERAL SUPERFICIAL CERVICAL PLEXUS BLOCK

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ABSTRACT:

Background: Regional anesthesia for post-thyroidectomy pain management has recently become a new trend that provides good quality of analgesia with a prolonged duration and fewer 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 24 hours postoperatively.

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

دراسة لمقارنة طريقتين لمنع الألم بعد عملية استئصال الغدة الدرقية باستخدام التخيدير الموضعي و تخدير العصب العنقي السطحي

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التخدير الموضعي لمنع الألم بعد عملية استئصال الغدة الدرقية أصبح من الطرق الجديدة التي لها تأثير جيد و طويل الأمد و كذلك لها أقل مضاعفات من التخدير الوريدي . و هدف هذه الدراسة هو المقارنة بين التخدير الموضعي و تخدير العصب العنقي السطحي بعد إجراء عمليات استئصال الغدة الدرقية . حيث تمت الدراسة علي عدد 60 حالة و تم توزيع الحالات إلي ثلاثة مجموعات . المجموعة الأولى لم يتم إعطائها اي نوع من التخدير و المجموعة الثانية تم إعطائها تخدير موضعي و المجموعة الثالثة تم تخدير العصب العنقي السطحي و بعد ذلك تمت متابعة حدة الألم بعد العملية لمدة 24 ساعة . وكانت النتائج إن إعطاء التخدير الموضعي و تخدير العصب العنقي السطحي يخفف الألم بعد العملية و كانت نسبة تخفيف الألم أكثر في حالة استخدام طريقة تخدير العصب العنقي السطحي .

INTRODUCTION

Post-thyroidectomy acute pain should be controlled especially during the first postoperative 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 a new trend that provides good quality of postoperative analgesia with a prolonged duration and fewer side effects. Other advantages of regional anesthesia include its sparing effect on the intra and postoperative analgesic requirements, and decreasing the demands 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 block is associated with many complications including hemidiaphragmatic 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 postoperative analgesic efficacy of bilateral superficial cervical plexus block (BSCB) versus LWI after thyroid surgery.

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 their 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 the 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 pre-medicated 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 continues 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 (caudal) 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. A 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 stay for at least 1 hr, and then they were transferred to the ward.

Pain assessment was done postoperatively in 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 pethedine intramuscularly if the NRS score was ≥ 4 or VRS ≥ 3 .

Prophylactic antiemetics (metoclopramide) were not administered.

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

Values are presented as mean \pm 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

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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).

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.

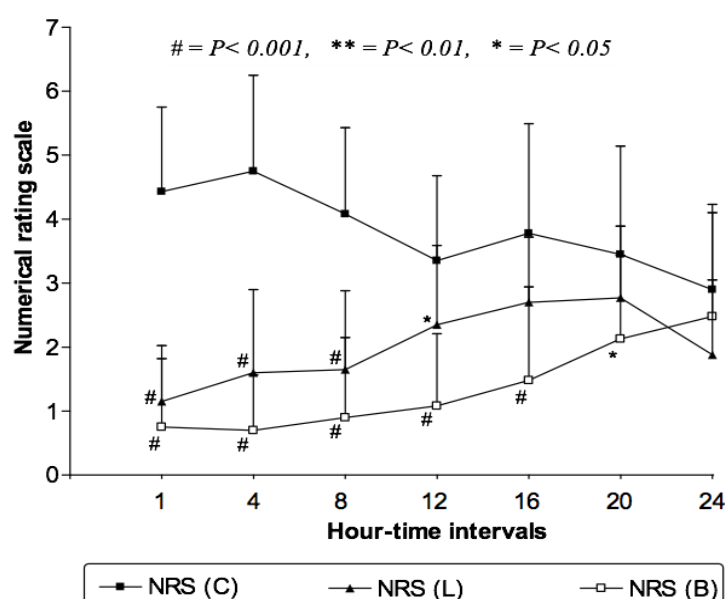


Figure-1: Mean numerical rating scale (NRS) pain scores in the control (C), local wound infiltration (L) and bilateral superficial cervical plexus (B) groups during the first 24 hours after surgery.

Vertical bars are standard deviation. Pain scores were significantly lower in (L) and (B) groups when compared with (C) group.

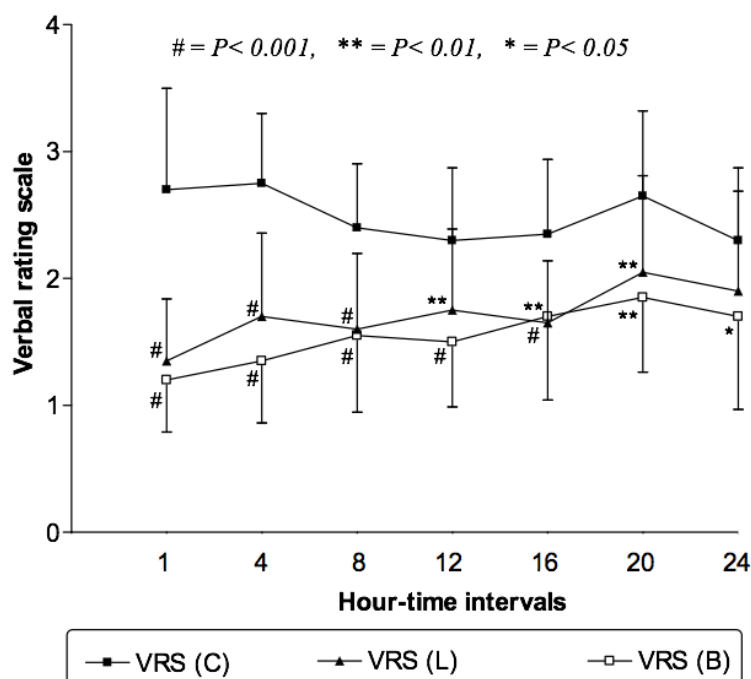


Figure-2: Mean verbal rating scale (VRS) pain scores in the control (C), local wound infiltration (L) and bilateral superficial cervical plexus (B) groups during the first 24 hours after surgery. Vertical bars are standard deviation. Pain scores were significantly lower in (L) and (B) groups when compared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

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).

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

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

The proportion of patients with a NRS score \geq 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.

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 *** = ($P< 0.001$)).*

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).

The number of patients who required postoperative pethedine, and the total amount of pethedine 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).

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

	Group (C)	Group (L)	Group (B)
Number of patients required analgesia:	15 (75%)	7 (35%) **	4 (20%) ***
Time to first analgesia (min):	162 \pm 124	544 \pm 320 **	860 \pm 59 ***
Total pethedine doses (mg):	60 \pm 44.7	20 \pm 29.9 **	12.5 \pm 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 *** = ($P< 0.001$)).*

Regarding the incidence of postoperative nausea and vomiting and the number of patients who 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.

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 pethedine, 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 reduces 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 literature dispute 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 much of the previous research, due to the fact that 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.

The results of this study support 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 (tab1-4). Dieudonne et al.⁽¹⁾ concluded that BSCB alone cannot provide optimal pain relief because 65% of patients still 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 NRS to be more convenient than VAS in the early postoperative period.^(17, 20, 21) VRS was chosen mainly because of the simplicity of its application 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 caused by VRS, which is frequently described as being noncontiguous and less precise.^(16, 18)

The current study did not evaluate VRS, as this was beyond the scope of

the study. However VRS was actually easier for all patients to understand, and it generally 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 pethedine 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 causes a greater decrease in postoperative pethedine consumption than LWI.

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