

Original Research Article

Comparative Study of Pre-Emptive Analgesia by Bilateral Superficial Cervical Plexus Block Induced by Levobupivacaine vs Ropivacaine in Thyroid Surgeries

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ABSTRACT

Background: Thyroid surgery is the most common endocrine surgery done over the world, which requires analgesia due to mild to moderate pain. It is commonly done under general anesthesia and locoregional techniques like local infiltration along incision line and regional blocks such as superficial cervical plexus block. Bilateral superficial cervical plexus block (BSCPB) is preferred, as it is simple and efficient to counteract pain, stress response caused during perioperative period. The study was done to compare depth of analgesia of levobupivacaine and ropivacaine using ultrasound guided bilateral superficial cervical plexus block in patients undergoing thyroid surgeries under general anesthesia.

Methods: 60 consenting patients were included in the study and divided into two groups. Group A received BSCPB with levobupivacaine 0.25% (n = 30) and group B received ropivacaine 0.25% (n = 30), in this double blind, randomised study. Demographic profile, hemodynamic parameters, total duration of analgesia with total requirement of fentanyl in intraoperative period were evaluated. Post operatively, visual analogue score (VAS) was seen and tramadol was given as rescue analgesic drug whenever VAS $\geq$ 4.

Results: Duration of analgesia was significantly higher in the levobupivacaine group (480 mins (450-540)) compared to ropivacaine group (330 mins (240-360)). There was statistical difference in the number of patients requiring intraoperative fentanyl (p value <0.05). In levobupivacaine group, 9 (30.0 %) patients required fentanyl and in ropivacaine group, 13 (43.33%) patients required fentanyl. Levobupivacaine group had significantly lower VAS score compared to ropivacaine group.

Conclusion: Pre-emptive analgesia by BSCPB using levobupivacaine has better analgesic efficacy in comparison to ropivacaine in patients undergoing thyroid surgeries under general anesthesia. Bilateral superficial cervical plexus block is an effective, safe and useful method to manage pain in patients undergoing thyroid surgeries.

Keywords: Epidural analgesia; Ropivacaine; Tramadol; Fentanyl; Postoperative pain.

INTRODUCTION

Pain is defined as "an unpleasant sensory and emotional experience associated with actual potential tissue damage, or described in terms of such damage" by the international association for study of pain (ISAP).^[1] Post-

operative pain following thyroid surgeries is always underestimated and under treated.

The clinical concept of introducing analgesic management before the onset of noxious stimuli is called pre-emptive analgesia, and it helps to prevent pain sensitisation. Pre-emptive analgesia aims to block nociceptive

input before surgical stimulation, reducing central sensitization and improving postoperative comfort. Pain is present in almost all surgical procedures and it is inadequately treated in majority of them.^[2]

Thyroidectomy patients commonly experience incisional pain, throat discomfort, and swallowing difficulties. There are various techniques to treat pain. It can be either by use of local anesthetics at peripheral level, nonsteroidal anti-inflammatory drugs (NSAIDs), opioids or other analgesics, peripheral nerve blocks with local anesthetics, or a combination of these techniques. Superficial cervical plexus block or deep cervical plexus block can be used to provide analgesia for thyroid surgery patients. Deep cervical plexus block can also be used but it is associated with complications like phrenic nerve palsy. BSCPB is widely preferred due to its safety, simplicity, and effectiveness.^[3-5]

Bilateral superficial cervical plexus block can be performed using either landmark guided or ultrasound guided technique. Ultrasound guided BSCPB has become more reliable technique over time as it increases the success of block and avoids inadvertent injection into important surrounding structures. The main aim of our study was to perform ultrasound guided bilateral cervical plexus block in patients undergoing thyroid surgeries under general anaesthesia and to compare the analgesic efficacy of levobupivacaine vs ropivacaine.

The objective was to study the duration of analgesia using VAS score, to know the requirement of rescue analgesic and intraoperative variation in hemodynamic parameters in both the groups.

MATERIALS & METHODS

Study Design

This randomized, double-blind study included 60 patients allocated to two groups: - Group A: 0.25% levobupivacaine, 10 ml per side - Group B: 0.25% ropivacaine, 10 ml per side Blocks were performed under ultrasound guidance (Ultrasound system with high-frequency linear probe, Manufacturer, Location) using a high-frequency linear probe (Manufacturer,

Location) (8-18 MHz). Drug was deposited between the sternocleidomastoid and scalene muscles.

General anesthesia included fentanyl, propofol, and vecuronium. Hemodynamic parameters (HR, SBP, DBP, SpO₂, EtCO₂) were monitored throughout surgery. Fentanyl 20 µg was administered for a ≥20% rise in HR or SBP.

Postoperative VAS assessments were recorded at 0, 3, 6, 9, 12, and 24 hours. Tramadol 50 mg IV was administered when VAS ≥ 4.

Ethical Approval

This study was approved by the Institutional Ethics Committee: BV(DU)/MC&H/Sangli/IEC/547/24.

Eligibility Criteria

Patients aged 18-60 years, classified as ASA physical status I-II, scheduled for total thyroidectomy were included. Exclusion criteria included refusal to participate, ASA > II, pregnancy, bleeding disorders, psychiatric illness, drug allergies, chronic analgesic use, thyroid malignancy, respiratory compromise, and substernal goitre. Pain assessment was performed using the Visual Analog Scale (VAS).

Statistical Analysis

Data were analyzed using SPSS-29. Non-parametric tests were applied due to non-normal distribution. A p-value < 0.05 was considered statistically significant.

RESULTS

Among the 60 patients who underwent thyroid surgeries, 30 patients received levobupivacaine and rest received ropivacaine. Both groups were comparable to each other in terms of age, gender and weight. There were no dropouts in our study. A total of 60 patients were enrolled and randomly allocated into two equal groups. The demographic characteristics of the participants, including age, weight, gender distribution, and ASA physical status, were comparable between the two groups with no statistically significant differences (p > 0.05), indicating adequate baseline homogeneity between the study populations.

Variable	Group A (Levobupivacaine) n = 30	Group B (Ropivacaine) n = 30	P-value
Age (years)	41.2 ± 9.6	39.8 ± 10.1	0.58
Weight (kg)	61.4 ± 8.7	60.2 ± 9.1	0.63
Gender (Male)	6 (20%)	5 (16.7%)	0.74
Gender (Female)	24 (80%)	25 (83.3%)	

ASA I	18 (60%)	17 (56.7%)	0.79
ASA II	12 (40%)	13 (43.3%)	

Table 1. Demographic Characteristics of Study Participants

Duration of Analgesia (mins)	Q1	Median	Q3	Kruskal-Wallis H	p-value
Group A	450	480	540	33.579	< .001>
Group B	240	330	360		

Table 2: Total duration of analgesia among both groups

In Table 1, there was statistically significant difference in the median duration of analgesia in Group A and Group B. Median

duration of analgesia in Group A is 480 (450-540) mins and in Group B was 330 (240-360) mins.

Patients requiring Fentanyl	Group A (n=30)	Group B (n=30)
YES	9 (30.0%)	13 (43.30%)
NO	21 (70.0%)	17 (56.70%)
p value	<0.05	

Table 3: Fentanyl requirement among patients in both groups

In Table 2, there was statistical difference in the number of patients requiring intraoperative fentanyl (p value <0.05). 9 (30.0

%) patients in Group A required fentanyl and 13 (43.33%) patients in Group B required fentanyl.

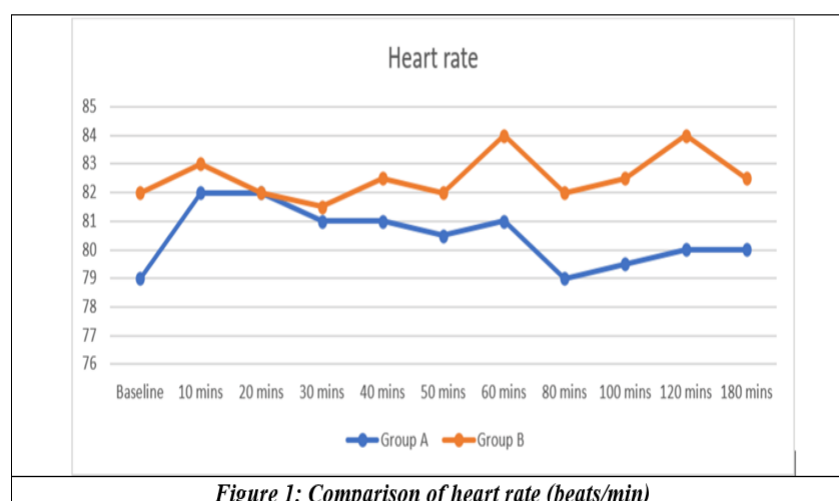


Figure 1: Comparison of heart rate (beats/min)

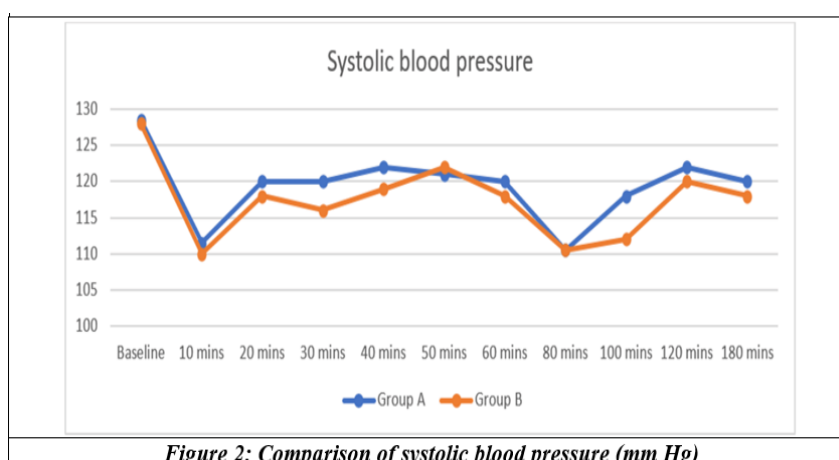
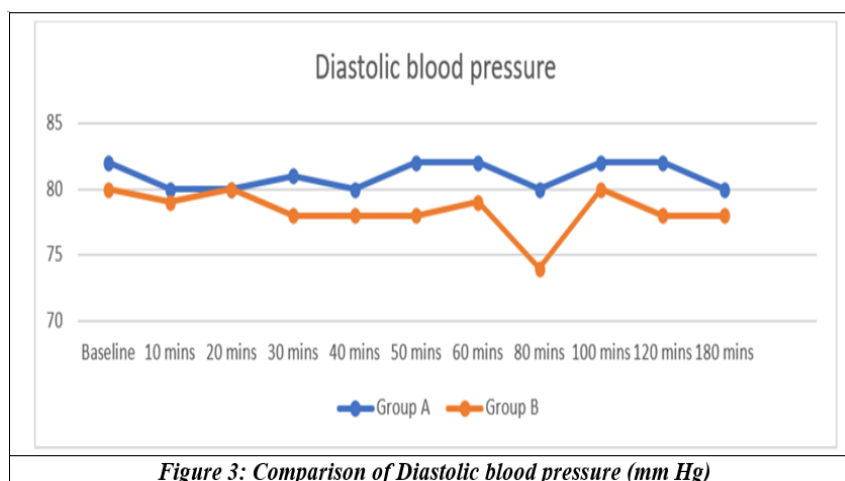


Figure 2: Comparison of systolic blood pressure (mm Hg)



In the above figures, there was no statistically significant difference in the median heart rate, systolic blood pressure and spo2.

Slight significant differences were present in the diastolic blood pressure in few time periods.

VAS	Group A			Group B			Kruskal-Wallis H	p-value
	Q1	Median	Q3	Q1	Median	Q3		
0 hr	0	0	0	0	0	0	1	0.317
3 hrs	0	1	2	2	2	3	19.376	
6 hrs	2	3	3.25	2	3	5	2.438	0.118
9 hrs	3	3.5	5	3	5	6	8.083	0.004
12 hrs	2	3	4	2	3	4.25	1.477	0.224
24 hrs	2	2	4	3	3.5	4	14.332	

Table 4: VAS score among both the groups

In Table 3, there was statistically significant difference in median VAS at 3rd, 9th and 24th hour in Group A and Group B. But there was no statistically significant difference in median VAS at 0, 6th and 12th hr in both the groups. Levobupivacaine group had significantly lower VAS score compared to ropivacaine group.

DISCUSSION

Thyroidectomy remains one of the most frequently performed endocrine surgeries, and challenges related to pain management may arise at various perioperative stages.^[6] In the present study, the two groups were comparable in terms of demographic factors such as age, gender, and weight, enabling an unbiased comparison of analgesic outcomes. Patients who received levobupivacaine demonstrated a markedly reduced requirement for postoperative analgesics, with consistently lower VAS scores during the first 24 hours and a significantly prolonged time to first rescue analgesic. These findings indicate that levobupivacaine provides a longer and more effective duration of analgesia compared with ropivacaine.

Post-thyroidectomy discomfort commonly includes incisional pain, dysphagia, and throat irritation. Although NSAIDs and opioids are often used for symptom relief, concern over postoperative bleeding-especially in thyroid surgeries-frequently limits their use.^[5,7] This highlights the importance of regional anesthesia techniques such as BSCPB to provide safe and effective early postoperative analgesia.

The effectiveness of BSCPB has been well established. Shih et al. demonstrated that BSCPB reduces intraoperative anesthetic requirements and significantly decreases postoperative pain and hospital stay duration.^[5] Similarly, Dieudonné et al. and Choi et al. reported that BSCPB offers effective postoperative analgesia for surgeries involving the thyroid, clavicle, and carotid region.^[8,9]

Andrieu et al. evaluated BSCPB administered before thyroidectomy and found that both ropivacaine alone and ropivacaine combined with clonidine significantly reduced postoperative pain and analgesic requirements, findings that align closely with the present study.^[10] Avoidance of systemic analgesics due to their higher risk of postoperative nausea and

vomiting further underscores the value of regional blocks in this surgical population.

Superficial cervical plexus block is generally preferred over deep cervical plexus block because bilateral deep blocks carry a risk of severe complications such as phrenic nerve palsy.^[11] Our findings support the safety and effectiveness of the superficial approach.

Winstanley et al. compared BSCPB with local anesthetic wound infiltration and concluded that BSCPB improves early postoperative recovery and reduces 24-hour pain scores, although total analgesic intake remained similar.^[12] Likewise, Karthikeyan et al. showed that BSCPB with bupivacaine, with or without clonidine, prolongs analgesia and delays the first rescue analgesic requirement.^[13]

Kale et al. demonstrated that BSCPB administered either before or after surgery leads to significantly lower pain scores and a prolonged rescue analgesic interval compared with control groups, a result that is consistent with our findings.^[14]

Both study groups maintained stable heart rate, systolic blood pressure, diastolic blood pressure, and oxygen saturation throughout surgery. Although minor variations in diastolic pressure were noted at certain time points, these differences were not clinically significant.

In contrast to our results, Eti et al. found no difference in postoperative analgesic consumption or VAS scores between BSCPB and wound infiltration. This discrepancy may stem from differences in local anesthetic concentration or technique, which can influence the duration and effectiveness of the block.^[15]

Pharmacologically, ropivacaine is less lipophilic than levobupivacaine, resulting in reduced penetration of myelinated nerve fibers and lower potency. This characteristic contributes to its shorter duration of action and aligns with the analgesic trends observed in our study and previous reports.^[16]

Study Limitations

The study sample size was relatively small, which may limit generalizability. Only ASA I-II patients undergoing elective thyroidectomy were included; therefore, results may not apply to higher-risk populations. VAS scoring, while validated, is subjective and influenced by individual pain perception. Long-term postoperative outcomes beyond 24 hours were not evaluated.

CONCLUSIONS

Levobupivacaine provides superior analgesia compared to ropivacaine for BSCPB in thyroid surgery. The simplicity of the technique allows easy integration into routine practice without significantly increasing procedural time. Patients benefit from improved comfort and satisfaction, contributing to enhanced postoperative recovery.

AUTHOR CONTRIBUTIONS

Dr. Yojana Goyal was involved in the conceptualization and design of the study, data collection, investigation, case management, and overall supervision, and contributed substantially to the critical review and editing of the manuscript. **Dr. Varsha Patil** contributed to data collection and patient management and was involved in the preparation of the original draft of the manuscript. **Dr. Jyothsna Paranjape** contributed to data collection, patient management, and literature review, and participated in the preparation of the original manuscript draft. **Dr. Kunal Uday Patil** provided overall supervision and oversight of the project, contributed to project administration, and was involved in the critical review and editing of the manuscript. All authors critically reviewed the manuscript and approved the final version for publication.

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