Section: Anaesthesiology

Original Research Article

# COMPARISON OF ANALGESIC EFFICACY OF BILATERAL SUPERFICIAL CERVICAL PLEXUS BLOCK WITH ROPIVACAINE ALONE VS ROPIVACAINE WITH DEXAMETHASONE IN THYROID SURGERIES UNDER GENERAL ANAESTHESIA– A PROSPECTIVE, CONTROLLED, RANDOMIZED DOUBLE-BLINDED STUDY

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## ABSTRACT

**Background:** Thyroidectomy is the most common of the worldwide endocrine surgical procedures. Nowadays, they are performed on an ambulatory basis, so regional techniques are considered the mainstay for intra and postoperative analgesia. A popular method is the bilateral superficial cervical plexus block (BSCPB), a regional anaesthesia technique for its feasibility and efficacy. To increase the duration of peripheral single-shot nerve blocks, dexamethasone might be an excellent choice. This study aims to compare the analgesic efficacy of 0.5% ropivacaine with dexamethasone with 0.5% ropivacaine for BSCPB. **Materials and Methods:** One hundred patients of both genders, aged between 18 and 60 years, posted for thyroid surgery and undergoing bilateral superficial cervical plexus block under general anaesthesia were selected for the study. Patients were randomly divided into two groups of 50 each. Group A received 0.5%Ropivacaine 20ml (100mg) with 2ml of normal saline, and Group B received 0.5% Ropivacaine 20ml (100mg) with 2ml (8mg) dexamethasone. The primary outcome was the time to rescue analgesia, and the secondary outcomes were quality of intraoperative analgesia, duration of postoperative analgesia, time to first rescue antiemetic and duration of hospital stay. **Result:** The mean duration to first analgesic request was significantly longer in Group B than in Group A (9.28 ± 7.06 vs. 6.16 ± 0.58 hours; $P < 0.005$). Rescue analgesia was required by all patients in Group A compared with 32 patients in Group B ($P < 0.005$). Mean VAS scores were significantly lower in Group B at 4, 16, 20, and 24 hours postoperatively ($P = 0.001$). PONV scores were significantly lower in Group B at 2, 4, and 6 hours ($P < 0.005$). Intraoperative fentanyl consumption was significantly reduced in Group B compared with Group A (1.32 ± 0.36 vs. 2.00 ± 0.00; $P < 0.005$). **Conclusion:** BSCPB with dexamethasone is a safe, simple, and effective technique to reduce the intraoperative opioid requirement and prolong the postoperative analgesia during thyroidectomy surgeries. It significantly reduces the incidence of PONV and early postoperative pain.

## INTRODUCTION

Thyroidectomy is the most common of the worldwide endocrine surgical procedures. The use of regional anaesthesia as an effective adjuvant to general anaesthesia in most thyroid surgeries is now being accepted in many parts of the world. Paul Lo Gerfo was a notable pioneer of the use of cervical plexus block in thyroid and parathyroid surgeries.[1] Anesthesiologists have attempted to prevent these problems with various modalities, such as opioids and nonsteroidal anti-inflammatory drugs (NSAIDs), or with regional anaesthesia techniques. To decrease the postoperative pain and reduce the need for analgesics following thyroidectomy surgery, preoperative oral controlled-release analgesia with opioids, and alternative regional techniques such as local incisional anaesthesia, intraoperative bilateral superficial and/or deep cervical plexus block, and local wound infiltration with local analgesia have also been suggested


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recently.[2,3] Ropivacaine was introduced in 1996 and is a highly protein-bound amide local anaesthetic. It is structurally related to bupivacaine, with the same pKa (8.1), and is therefore characterised by a slow onset and a long duration of action. Ropivacaine had lower cardiotoxicity and greater motor-sensory block differentiation, resulting in less motor block. When ropivacaine is given in an equivalent dose to bupivacaine, there is less motor block and earlier recovery.[4] We preferred Ropivacaine in this study because it produces effective sensory analgesia and has less potential to cause cardiac and CNS toxicity in therapeutic doses when compared to bupivacaine. Many authors are concerned about the duration of analgesia after nerve blocks because it is often short. To increase the duration of peripheral single-shot nerve blocks, dexamethasone might be an excellent choice. Its mechanism of action is to increase the activity of inhibitory potassium channels on nociceptive 'c' fibres, thus prolonging the activity of local anaesthetics and inducing a degree of vasoconstriction, which delays their absorption.[5]

This study aims to compare the analgesic efficacy of bilateral superficial cervical plexus block with 0.5% Ropivacaine alone versus 0.5% Ropivacaine with 8mg Dexamethasone in thyroid surgeries under general anaesthesia. The secondary outcomes include duration of postoperative analgesia, requirement of intraoperative and postoperative rescue analgesia, intraoperative hemodynamic stability, use of first rescue antiemetic, incidence of postoperative nausea and vomiting, and duration of hospital stay.

## MATERIALS AND METHODS

After institutional ethics committee approval, CTRI registration and written informed consent from patients, 100 patients of both genders, aged between 18 and 60 years, and American Society of Anaesthesiologists class I or II, posted for thyroid surgery and undergoing bilateral superficial cervical plexus block under general anaesthesia, were selected for the study. The study process was explained to them in their own language, and written informed consent was obtained. Patients were randomly divided into two groups of 50 each. A master list of the drug assigned to each patient was kept in a secure location by a third party not directly connected to the study. This was revealed only to the person administering the drug outside the operating theatre at the time of the study. Only at the end of the study was the list released to the investigator for analysis of the study results. In this study, patients do not know which group they are assigned to, and the observer who records the data does not know which group theyare assigned to.

Group A received 0.5% Ropivacaine 20ml (100mg) with 2ml of normal saline, and Group B received 0.5% Ropivacaine 20ml (100mg) with 2ml (8mg) dexamethasone. Patient's refusal, age <18 and > 60 years, renal/hepatic disease, Infection at the site of block, Risk of bleeding, known allergy to the local anaesthetic, Chronic obstructive pulmonary disease, Bilateral/Unilateral Phrenic nerve palsy, H/o any neuromuscular disease/diabetes, and Patients with substernal goitre were excluded from the study.

All patients were thoroughly evaluated in a pre-anaesthetic checkup, and all relevant investigations were done. On the day of surgery, after securing the IV cannula, all the patients were premedicated with Inj. Midazolam 0.1mg/kg, Inj. Glycopyrrolate 0.01mg/kg, Inj. Ondansetron 0.1mg/kg, Inj. Fentanyl 2µg/kg. Preoxygenation was done for 3 minutes prior to induction. Induction of general anaesthesia was achieved with intravenous Thiopentone sodium 3mg/kg, and succinylcholine2mg/kg. Vecuronium bromide 0.1mg/kg was used to facilitate intubation.

Anaesthesia was maintained with 2–2.5% sevoflurane, 50% oxygen, and 50% nitrous oxide. Additional fentanyl was given to achieve hemodynamic stability. The target for mechanical ventilation is an end-tidal carbon dioxide concentration of 35–40 mmHg throughout the surgery. Monitoring during the surgery includes standard ASA monitors such as ECG, heart rate, pulse oximetry, blood pressure (non-invasive), and end-tidal carbon dioxide concentration.

After intubation, a bilateral superficial cervical plexus block was given. After cleaning the skin over the right lateral side of the neck with an antiseptic solution, a 22G hypodermic needle is inserted along the posterior border of the sternocleidomastoid muscle, the landmark was identified as the midline between the mastoid process and clavicular head of the sternocleidomastoid muscle, and three-point injection of 5mL of local anaesthetic was given behind the posterior border of the sternocleidomastoid muscle subcutaneously, perpendicularly, cephalad, and caudad directions and the procedure will be repeated over the left side.

The primary outcome, the time to first rescue analgesic (Visual Analogue scale >4), was recorded by the investigator. Postoperative pain was assessed using a visual analogue scale (0: no pain, to 10: the worst imaginable pain) once at the Postoperative care unit and then every 4 hr on the ward for 24 hrs. Rescue analgesia was tramadol 0.5 mg/kg, given if the VAS > 4. Nausea or vomiting was assessed using the numerical scale (0=no nausea; 10=worst imaginable nausea). An antiemetic 'rescue' drug (4 mg ondansetron intravenously) was administered in case of severe nausea (scale 4 or more) or vomiting within the study period.

Sample size was calculated from a pilot study of 20 patients using time to first rescue analgesic requirement as the primary outcome. Assuming a clinically significant difference of 15 minutes, a pooled standard deviation of 32.7 minutes, 90% power, and a two-sided alpha of 0.05, the required sample size was 50 patients per group (total n =


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100), calculated using the formula: $n = (Z\alpha + Z\beta)^2 \times 2SD^2/MD^2$.

Statistical analysis was performed using MS Excel and SPSS (version 28.0; IBM Corp., Armonk, NY, USA). Quantitative variables were expressed as mean ± standard deviation, while qualitative variables were presented as frequencies and percentages. The unpaired t-test was used to compare normally distributed quantitative variables, including demographic parameters, haemodynamic parameters, VAS scores, fentanyl consumption, rescue analgesic requirement, and rescue antiemetic requirement between the two groups. Qualitative variables such as gender and ASA status were analysed using the Chi-square test. A p-value <0.05 was considered statistically significant.

## RESULTS

Of the 100 screened patients, all the patients who met the inclusion criteria were randomly allocated to the two groups. The Consolidated Standards of Reporting Trials (CONSORT) flowchart is shown in Figure 1. Both groups were similar in terms of demographics and ASA classification (P> 0.05) [Table 1]. All 100 recruited patients underwent a successful BSCPB and completed the study. There was no block failure among the recruited patients.

Postoperative pain was assessed in both groups using a visual analogue scale at the immediate postoperative period and at 4, 8, 12, 16, 20, and 24 hours. The P-value was analysed using an unpaired t-test and found to be statistically significant at 4hrs, 16hrs, 20hrs, and 24hrs postoperatively (P=0.001) [Table 2]. The time to the first analgesic rescue requirement was significantly longer in Group B than in Group A. The mean time for the first analgesic request was 6.16 ± 0.58 hours in Group A and 14.50 ± 0.88 hours in Group B (p < 0.001) [Figure 1]. Rescue analgesia was administered when the VAS score exceeded 4. All 50 patients in Group A required rescue analgesia, whereas only 32 in Group B did. The difference between the groups was statistically significant on analysis using the Chi-square test (P < 0.005) [Figure 2].

Haemodynamic parameters, including heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure, were recorded at baseline and at 15, 30, 60, 120, and 180 minutes during the procedure. Comparison between the groups was performed using the unpaired t-test. No statistically significant differences were observed in haemodynamic parameters between the two groups, indicating comparable haemodynamic stability.

Postoperative PONV scores were compared at 0, 2, 4, 6, 12, and 24 hours. The difference between the groups was statistically significant at 2, 4, 6, 12, and 24 hours postoperatively, with lower PONV scores observed in Group B (P < 0.05) [Table 3]. No difference was observed at 0 hours postoperatively. The duration of hospital stay and the sleep quality analysis were comparable between the groups.

**Table 1: Demographic profile between the groups**

| Variables | | Group C | Group S | P value |
|---|---|---|---|---|
| Age (years) | | 40.38±5.35 | 41.60±5.59 | 0.26 |
| Gender | Female | 44 (88%) | 42 (84%) | 0.56 |
| | Male | 6 (12%) | 8 (16%) | |
| Weight (kgs) | | 62.30 ± 6.90 | 65 ± 7.31 | 0.06 |
| Height (cms) | | 167 ± 7.25 | 166.2333 ± 6.06 | 0.701 |
| BMI (kg/m2) | | 23.9 ±1.70 | 23.7587 ± 1.84 | 0.718 |
| ASA n (%) | 1 | 45 (90%) | 47 (92%) | 0.46 |
| | 2 | 5 (10%) | 3 (6%) | |

Values are expressed as (mean±SD) or number (percentage). BMI: body mass index; ASA American Society of Anaesthesiologists – Kilograms; cms – centimetres

**Table 2: Comparison of VAS score between groups**

| VAS | Group C | Group S | P VALUE |
|---|---|---|---|
| 0 hrs | 0.00 ± 0.00 | 0.00 ± 0.00 | - |
| 4 hrs | 2.58 ± 0.50 | 1.18 ± 0.39 | 0.001* |
| 8 hrs | 5.66 ± 2.10 | 4.80 ± 2.80 | 0.08 |
| 12 hrs | 7.62 ± 6.92 | 4.98 ± 6.99 | 0.06 |
| 16 hrs | 8.78 ± 0.42 | 5.76 ± 0.56 | 0.001* |
| 20 hrs | 9.90 ± 0.303 | 7.72 ± 0.45 | 0.001* |
| 24 hrs | 9.52 ± 0.68 | 8.12 ± 0.33 | 0.001* |

Values are expressed as (mean±SD). * P value – significant

**Table 3: Comparison of the incidence of PONV among the groups**

| Postoperative Time | Group A (n=50) | Group B (n=50) | P value |
|---|---|---|---|
| 0 h | 0 (0%) | 0 (0%) | 1.000 |
| 2 h | 16 (32%) | 5 (10%) | **0.006*** |
| 4 h | 18 (36%) | 7 (14%) | **0.011*** |
| 6 h | 14 (28%) | 4 (8%) | **0.009*** |
| 12 h | 10 (20%) | 2 (4%) | **0.014*** |
| 24 h | 6 (12%) | 1 (2%) | **0.049*** |

Values are expressed as number(percentage). *P value – significant


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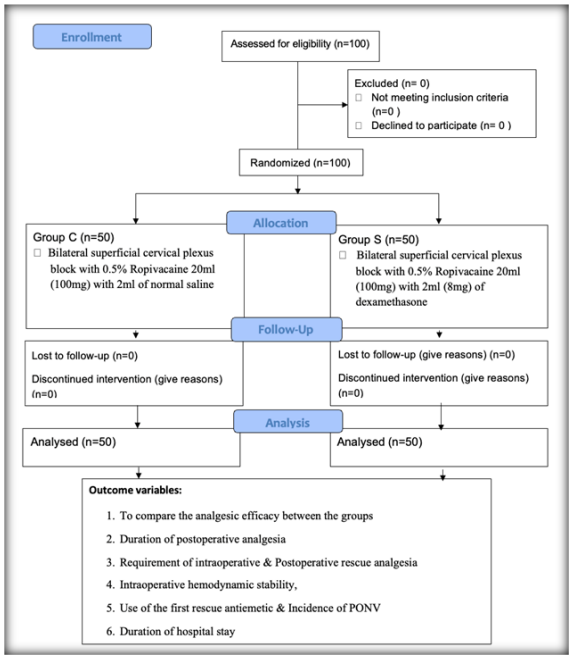


**Figure 1: CONSORT**

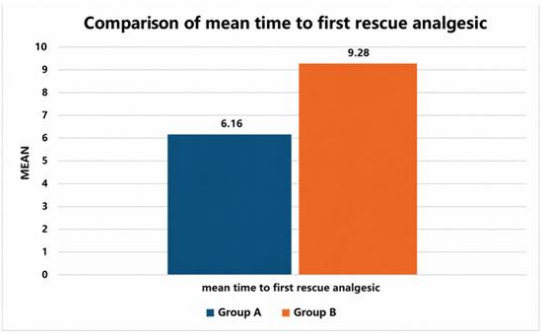


**Figure 2: Comparison of the mean Time of first rescue analgesia in hrs between groups**

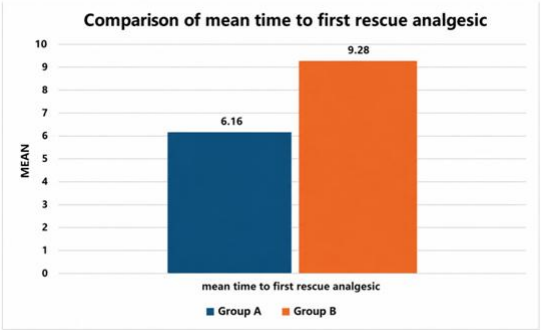


**Figure 3: Comparison of rescue analgesic (Tramadol mg/kg) between groups**

## DISCUSSION

Thyroidectomy is commonly associated with mild to moderate postoperative pain that can delay recovery and impair patient comfort.[6] Bilateral superficial cervical plexus block (BSCPB) is a simple, safe, and effective regional anaesthetic technique that provides postoperative analgesia by blocking the superficial branches of the cervical plexus supplying the anterior neck. Several studies have demonstrated that BSCPB reduces postoperative pain, opioid consumption, and postoperative nausea and vomiting (PONV), thereby facilitating enhanced recovery after thyroid surgery. While previous studies have primarily evaluated the analgesic efficacy of BSCPB using local anaesthetics alone or with adjuvants such as clonidine, limited evidence exists regarding the use of perineural dexamethasone as an adjuvant to ropivacaine. The present study therefore evaluated whether the addition of dexamethasone to ropivacaine for BSCPB could further prolong postoperative analgesia and improve perioperative outcomes compared with ropivacaine alone.

Ropivacaine is widely used for BSCPB because of its favourable safety profile and lower cardiotoxicity compared with bupivacaine. Owing to its lower lipid solubility, ropivacaine preferentially blocks sensory fibres while producing less motor blockade.[7] Dexamethasone is an effective adjuvant to peripheral nerve blocks due to its anti-inflammatory and antiemetic properties.[8,9] Perineural dexamethasone prolongs the duration of local anaesthetic action by reducing local inflammation, suppressing ectopic neuronal discharge, and decreasing systemic absorption through local vasoconstriction, thereby extending postoperative analgesia.[10-12]

In the present study, the addition of 8 mg dexamethasone to 0.5% ropivacaine for BSCPB significantly prolonged the duration of postoperative analgesia, delayed the first rescue analgesic request, reduced postoperative pain scores, decreased intraoperative fentanyl consumption, and lowered the incidence of PONV compared with ropivacaine alone.

Our findings are consistent with those of Khaled et al., who reported lower postoperative pain scores, prolonged analgesia, reduced rescue analgesic requirements, and a lower incidence of PONV after adding dexamethasone to bupivacaine for BSCPB.[13] Similar benefits of BSCPB have been demonstrated by Andrieu et al. [14], Dieudonne et al. [15], Steffen et al. [16] and Suh et al. [17], all of whom observed reduced postoperative pain and analgesic requirements following thyroid surgery.

Likewise, Shih et al. [6] reported a significantly longer time to first analgesic request with long-acting local anaesthetics, while Cai et al. demonstrated lower early postoperative pain scores, reduced PONV, and decreased antiemetic requirements with ropivacaine.[18] Karthikeyan et al. also reported improved postoperative analgesia and reduced opioid consumption with the addition of clonidine as an adjuvant to bupivacaine.[19]

Overall, the present findings support the growing evidence that BSCPB is an effective component of multimodal analgesia for thyroidectomy. The addition of dexamethasone to ropivacaine further enhances block quality by prolonging postoperative


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analgesia, reducing opioid requirements, and decreasing PONV, thereby improving postoperative recovery and patient comfort.

**Limitations of the study:** The present study has several limitations. The intraoperative sevoflurane consumption was not quantified, although previous studies have shown that BSCPB can reduce volatile anaesthetic requirements. In addition, while the sevoflurane concentration was adjusted intraoperatively, the nitrous oxide concentration remained constant. As nitrous oxide is a recognised risk factor for postoperative nausea and vomiting (PONV), its use may have influenced the observed incidence of PONV.[5] Finally, only the bilateral superficial cervical plexus block was evaluated. Although combining superficial and deep cervical plexus blocks may provide additional analgesia, the deep cervical plexus block is associated with a higher risk of complications, including vertebral artery puncture, inadvertent subarachnoid or epidural injection, and phrenic nerve palsy.[20]

## CONCLUSION

Preoperative BSCPB with 0.5% ropivacaine with dexamethasone provides effective analgesia, reduces PONV and perioperative opioid consumption, and may enhance postoperative recovery in thyroidectomy patients undergoing general anaesthesia.

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