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COMPARISON OF 0.5% ROPIVACAINE VERSUS 0.5% ROPIVACAINE WITH DEXMEDETOMIDINE IN BILATERAL SUPERFICIAL CERVICAL PLEXUS BLOCK FOR POSTOPERATIVE ANALGESIA IN THYROID SURGERY

[1]Dr Guru Prasaath, [2]Dr Bhagyavardhan Botta, [3]Dr Shruthi Vinothkumar, [4]Dr Aswin Mohanram, [5]Dr Chethana, [6]Dr.Yogarajan Ramalingam

[1]Postgraduate, Department of Anaesthesiology and Critical Care, Sree Balaji Medical College and Hospital, No. 7, CLC Works Road, Chromepet, Chennai – 600044, Tamil Nadu, India, Bharath Institute of Higher Education and Research (BIHER), Email: 777guru.prasaath@gmail.com, Orcid id 0009-0008-1271-8980
[2]Associate Professor, Department of Anaesthesiology, Sree Balaji Medical College and Hospital, No. 7, CLC Works Road, Chromepet, Chennai – 600044, Tamil Nadu, India, Bharath Institute of Higher Education and Research (BIHER), Email: bhagyavardhan@gmail.com, Orcid id 0000-0002-6365-4541
[3]Senior Resident , Department of Anaesthesiology, sree balaji medical college and hospital, no.7, CLC works road, chromepet, chennai 600044, Email id- drshruthidarshan@gmail.com, ORCID iD: 0009-0007-1845-7796
[4]Assistant professor, Department of Anaesthesiology, sree balaji medical college and hospital, no.7, CLC works road, chromepet, chennai 600044, Orchid ID. 0009-0003-9617-5066, Email. aswinmohan786@gmail.com
[5]Senior Resident,Department of Anaesthesiology, Sree Balaji medical college and Hospital, Chennai-44, ORCID ID- 0009-0003-6706-2054, Email- drchethanach@gmail.com
[6]Professor, Anaesthesiology, Sree Balaji Medical College and Hospital , Chennai-44, ORCID ID - 0009 0004 3747 9921, yogaraj1986@yahoo.co.in

ABSTRACT

Background: Effective postoperative analgesia is important following thyroid surgery. Bilateral superficial cervical plexus block provides regional analgesia, but the duration of analgesia may be limited. Dexmedetomidine has been investigated as an adjuvant to local anaesthetics to prolong analgesic effects. This study compared 0.5% ropivacaine alone with 0.5% ropivacaine combined with dexmedetomidine for postoperative analgesia following thyroid surgery.

Methods: A prospective, randomized, double-blind comparative study was conducted among 40 patients aged 18–65 years, classified as ASA I or II, undergoing elective thyroid surgery. Participants were randomly allocated into two equal groups of 20. Group R received bilateral superficial cervical plexus block with 0.5% ropivacaine (20 mL per side), while Group RD received 0.5% ropivacaine with dexmedetomidine 0.5 μg/kg (20 mL per side). The primary outcome was duration of postoperative analgesia. Secondary outcomes included VAS pain scores, time to first rescue analgesia, total analgesic consumption, rescue analgesic doses, haemodynamic parameters, sedation, patient satisfaction and adverse effects. Patients were followed for 24 hours postoperatively.

Results: Mean duration of analgesia was significantly longer with ropivacaine plus dexmedetomidine than ropivacaine alone (14.6 ± 2.3 vs 6.8 ± 1.4 hours; $p < 0.001$). Time to first rescue analgesia was also prolonged (15.2 ± 2.4 vs 7.2 ± 1.5 hours; $p < 0.001$). Total postoperative analgesic consumption was lower (286.3 ± 46.9 vs 412.5 ± 58.4 mg; $p < 0.001$), as was the number of rescue doses (1.4 ± 0.5 vs 2.8 ± 0.6; $p < 0.001$). VAS scores were significantly lower at 8, 12 and 24 hours. Excellent satisfaction was higher with dexmedetomidine (65% vs 30%; $p = 0.01$). Postoperative haemodynamic parameters were comparable, although early sedation was greater with dexmedetomidine.

Conclusion: Adding dexmedetomidine to 0.5% ropivacaine significantly prolonged analgesia, reduced postoperative analgesic requirements and improved pain control and patient satisfaction following thyroid surgery, with no significant difference in postoperative haemodynamic parameters.

INTRODUCTION

Postoperative pain is an important consideration following thyroid surgery and may adversely affect early recovery, patient comfort, mobilization, and overall perioperative experience. Effective perioperative analgesia therefore requires an approach that provides adequate pain control while minimizing opioid requirements and their associated adverse effects. Regional anaesthetic techniques have increasingly been incorporated into multimodal perioperative analgesia because they can provide targeted analgesia while reducing the requirement for systemic analgesic medications.

The cervical plexus is formed predominantly by the anterior rami of the upper cervical spinal nerves and provides sensory innervation to substantial portions of the neck. The superficial cervical plexus gives rise to the lesser occipital, great auricular, transverse cervical, and supraclavicular nerves, which provide cutaneous sensory supply to the anterolateral neck and surrounding regions. Understanding this anatomy is fundamental to the appropriate performance of superficial cervical plexus block and its application in neck surgery [1-3]. The use of regional anaesthesia and peripheral nerve blocks as components of perioperative analgesic management is well established in modern anaesthetic practice [1,2].

Bilateral superficial cervical plexus block (BSCPB) has been investigated as an adjunct to general anaesthesia in patients undergoing thyroid surgery. The rationale for this technique is to provide regional analgesia to the superficial sensory

structures involved in the surgical field, thereby reducing postoperative pain and potentially decreasing the requirement for systemic rescue analgesics. A systematic review and meta-analysis specifically evaluating superficial cervical plexus block in thyroid surgery supports its clinical relevance as an analgesic intervention in this setting [4].

Several randomized clinical trials have evaluated the analgesic efficacy of BSCPB during thyroid surgery. Steffen et al. demonstrated that bilateral superficial cervical plexus block was associated with significantly lower postoperative pain compared with placebo in patients undergoing thyroid surgery [5]. In their randomized trial, patients receiving cervical plexus block with bupivacaine experienced less postoperative pain than those receiving placebo, although the amount of postoperative analgesic use did not differ significantly between groups.

Shih et al. further evaluated bilateral superficial cervical plexus block combined with general anaesthesia in thyroid operations and reported clinically important benefits. Their prospective randomized study demonstrated reduced intraoperative anaesthetic requirements, fewer patients requiring postoperative analgesics, a longer interval before the first postoperative analgesic dose, and lower postoperative VAS pain scores during the first 24 hours in patients receiving the block [6].

Andrieu et al. specifically examined the analgesic efficacy of bilateral superficial cervical plexus block using ropivacaine in patients undergoing total thyroidectomy under general anaesthesia. In their randomized controlled study, patients receiving ropivacaine BSCPB required less postoperative rescue analgesia and had lower pain scores during the immediate postoperative period compared with placebo [7]. The study also demonstrated that the addition of clonidine influenced intraoperative analgesic requirements, supporting the broader concept that adjuvants may enhance the effects of local anaesthetic-based regional techniques.

Dieudonne et al. evaluated bilateral superficial cervical plexus block using bupivacaine after thyroid surgery in a double-blind randomized placebo-controlled trial. The intervention significantly reduced the proportion of patients requiring morphine during the first 24 postoperative hours and was associated with lower initial postoperative pain scores [8]. However, the authors also concluded that cervical plexus block alone did not provide complete postoperative analgesia, highlighting the importance of integrating regional anaesthesia into a broader multimodal analgesic strategy.

Similarly, Eti et al. investigated whether bilateral superficial cervical plexus block could reduce analgesic requirements following thyroid surgery. Their randomized double-blind study compared cervical plexus block with local anaesthetic wound infiltration and further contributed to the evidence supporting regional analgesia as a means of improving postoperative pain management after thyroid surgery [9].

More recent randomized evidence has continued to support the role of superficial cervical plexus blockade in thyroidectomy. Goulart et al. studied 100 patients undergoing total thyroidectomy and reported lower postoperative pain and reduced opioid consumption among patients receiving bilateral superficial cervical plexus blockade in addition to general anaesthesia [10]. In that study, the reduction in opioid requirement was particularly evident during the early postoperative period, supporting the role of the block as an adjunct to conventional analgesic management.

Despite these findings, the duration of analgesia provided by local anaesthetic peripheral nerve blocks remains limited by the pharmacological duration of the local anaesthetic agent. Consequently, interest has developed in the use of adjuvant drugs that may prolong block duration and improve postoperative analgesia. Dexmedetomidine, a selective α2-adrenergic agonist, has emerged as one such potential adjuvant. The present study therefore focuses on comparing 0.5% ropivacaine alone with 0.5% ropivacaine combined with dexmedetomidine in bilateral superficial cervical plexus block for postoperative analgesia in thyroid surgery.

METHODOLOGY

The present study was conducted as a prospective, randomized, double-blind comparative clinical study to evaluate and compare the effectiveness of 0.5% plain ropivacaine versus 0.5% ropivacaine combined with dexmedetomidine (0.5 μg/kg) administered through bilateral superficial cervical plexus block (BSCPB) for postoperative analgesia in patients undergoing thyroid surgery. The study compared the duration of analgesia, postoperative pain scores, rescue analgesic requirements, haemodynamic changes, patient satisfaction and the incidence of adverse effects between the two groups. The study was conducted in the Department of Anaesthesiology, Sree Balaji Medical College and Hospital, Chennai, a tertiary-care teaching hospital with a regular thyroid surgery workload. The total study duration was 18 months. Adult patients undergoing elective thyroid surgery under general anaesthesia were screened for eligibility and enrolled if they fulfilled the predefined inclusion criteria.

Patients aged 18–65 years undergoing elective thyroid surgery, classified as ASA Physical Status I or II, and willing to participate after providing written informed consent were eligible for inclusion. Patients with known allergy to ropivacaine or dexmedetomidine, significant cardiovascular, renal or hepatic dysfunction, pregnancy or lactation, coagulopathy or infection at the proposed injection site, anatomical abnormalities of the cervical region, or those receiving chronic opioid therapy were excluded from the study.

The sample size was calculated using the formula for estimation of a proportion, where Z was taken as 1.96 for a 95% confidence level, the expected proportion (P) was 0.70, Q was 1 − P (0.30), and the absolute precision (d) was 0.05. Based on the calculated sample size, feasibility and institutional case availability, the final sample size was fixed at 40 patients. The study was stated to have 80% power with a 95% confidence level. The 40 participants were equally allocated into two groups, with 20 patients in each group. Random allocation was performed using a computer-generated random number sequence. Allocation concealment was maintained using sequentially numbered, sealed, opaque envelopes, which were opened immediately before preparation of the study medication.

The study was conducted in a double-blind manner. The study medication was prepared by an anaesthesiologist who was not involved in administration of the block or postoperative data collection. The anaesthesiologist administering the block

and the investigator assessing postoperative outcomes were blinded to group allocation. Group R consisted of 20 patients who received bilateral superficial cervical plexus block with 0.5% ropivacaine, 20 mL on each side. Group RD consisted of 20 patients who received bilateral superficial cervical plexus block with 0.5% ropivacaine combined with dexmedetomidine at a dose of 0.5 μg/kg, with a total injectate volume of 20 mL per side. The total injectate volume was kept constant between the two groups to maintain blinding.

All patients underwent detailed pre-anaesthetic evaluation, including medical history, physical examination, airway assessment and laboratory investigations according to the institutional protocol. Patients were kept nil per oral for 8 hours before surgery. On the day of surgery, patients were shifted to the operating theatre and baseline vital parameters, including heart rate, systolic blood pressure, diastolic blood pressure, respiratory rate and peripheral oxygen saturation (SpO_2), were recorded. Patients were preoxygenated with 100% oxygen at a flow rate of 6 L/min for 3 minutes. Intravenous midazolam 1 mg, glycopyrrolate 0.2 mg and fentanyl 2 mg/kg were administered as specified in the study protocol. Anaesthesia was induced with propofol 2 mg/kg. Following confirmation of ventilation by bag and mask, neuromuscular blockade was achieved using either vecuronium 0.1 mg/kg or atracurium 0.5 mg/kg. After 3 minutes of ventilation and adequate neuromuscular relaxation, an appropriately sized endotracheal tube was secured. Following confirmation of bilateral air entry, controlled ventilation was instituted with the ventilator settings maintained according to the study protocol. Anaesthesia was maintained throughout surgery using oxygen, nitrous oxide and sevoflurane with controlled ventilation.

For bilateral superficial cervical plexus block, the patient was positioned supine with slight extension of the neck and the head turned to the opposite side. A linear ultrasound probe with a frequency of 10–15 MHz was used. A scout scan was performed by placing the probe transversely at the level of the cricoid cartilage to identify the sternocleidomastoid muscle and internal jugular vein. Using an in-plane approach, a 22-gauge block needle was advanced from lateral to medial into the fascial plane between the sternocleidomastoid muscle and the investing layer of the deep cervical fascia. After negative aspiration, the assigned study drug was injected incrementally under real-time ultrasound visualization to ensure adequate hydrodissection of the fascial plane. The same procedure was subsequently performed on the contralateral side. Strict aseptic precautions were maintained throughout the block procedure.

Intraoperative monitoring consisted of continuous electrocardiography, non-invasive blood pressure, heart rate and peripheral oxygen saturation monitoring. Haemodynamic parameters were recorded at baseline, after induction, after administration of the block and at regular intervals during the intraoperative period. The primary outcome was duration of analgesia, defined as the time interval between completion of the block and the patient's first request for rescue analgesia. Secondary outcomes included postoperative pain assessed using the Visual Analogue Scale (VAS) at 0, 2, 4, 6, 12 and 24 hours, time to first rescue analgesic, total postoperative analgesic consumption within 24 hours, postoperative haemodynamic parameters, patient satisfaction assessed at 24 hours and the incidence of adverse effects.

Postoperatively, all patients were monitored for 24 hours. Rescue analgesia was administered when the VAS score was ≥4. The time to first rescue analgesic and total analgesic consumption during the 24-hour postoperative period were recorded. Patients were also assessed for adverse effects including bradycardia, hypotension, nausea, vomiting, local anaesthetic toxicity, haematoma and hoarseness. Patient satisfaction was assessed at 24 hours after surgery.

The collected data were entered into Microsoft Excel and analysed using IBM SPSS software. Continuous variables were expressed as mean ± standard deviation (SD) and compared between groups using the independent t-test. Categorical variables were expressed as frequency and percentage and compared using the Chi-square test. A p-value of <0.05 was considered statistically significant. Institutional Ethics Committee approval was obtained before commencement of the study. Written informed consent was obtained from all participants, and confidentiality of patient information was maintained throughout the study.

RESULTS

Table 1. Demographic Characteristics of Study Participants

Variable	0.5% Ropivacaine Group (n=20)	0.5% Ropivacaine + Dexmedetomidine Group (n=20)	p value
Age (years), Mean ± SD	42.1 ± 9.6	41.4 ± 8.9	0.78
Gender, n (%)			
Male	6 (30%)	7 (35%)	0.74
Female	14 (70%)	13 (65%)	—
Weight (kg), Mean ± SD	61.3 ± 6.2	62.1 ± 5.9	0.66
BMI, Mean ± SD	23.4 ± 2.1	23.7 ± 2.3	0.64
ASA Physical Status, n (%)			
ASA I	13 (65%)	14 (70%)	0.74
ASA II	7 (35%)	6 (30%)	—
Total	20 (100%)	20 (100%)	—

Table 1 presents the demographic and baseline clinical characteristics of the 40 study participants, with 20 patients in each group. The mean age was 42.1 ± 9.6 years in the 0.5% ropivacaine group and 41.4 ± 8.9 years in the ropivacaine–dexmedetomidine group, with no statistically significant difference ($p = 0.78$). Females constituted the majority of participants in both groups, accounting for 70% and 65%, respectively, while males accounted for 30% and 35%; the difference was not statistically significant ($p = 0.74$). Mean body weight and BMI were also comparable between groups,

with no significant differences (p = 0.66 and p = 0.64, respectively). Regarding ASA physical status, 65% and 70% of patients were classified as ASA I, while 35% and 30% were classified as ASA II in the respective groups (p = 0.74). Overall, the two groups were comparable with respect to their baseline demographic and clinical characteristics.

Table 2. Type and Duration of Surgery

Variable	0.5% Ropivacaine Group (n=20)	0.5% Ropivacaine + Dexmedetomidine Group (n=20)	p value
Type of surgery, n (%)			
Total thyroidectomy	12 (60%)	11 (55%)	0.75
Hemithyroidectomy	8 (40%)	9 (45%)	—
Duration of surgery (min), Mean ± SD	102.4 ± 15.3	104.1 ± 14.8	0.71

Description:
Table 2 compares the type and duration of thyroid surgery between the two study groups. Total thyroidectomy was performed in 12 (60%) patients in the ropivacaine group and 11 (55%) patients in the ropivacaine–dexmedetomidine group. Hemithyroidectomy was performed in 8 (40%) and 9 (45%) patients, respectively. The distribution of surgical procedures was comparable between groups (p = 0.75). The mean duration of surgery was 102.4 ± 15.3 minutes in the ropivacaine group and 104.1 ± 14.8 minutes in the combination group, with no statistically significant difference (p = 0.71). Thus, both groups were comparable with respect to surgical type and operative duration.

Table 3. Baseline Hemodynamic Parameters

Parameter	0.5% Ropivacaine Group (n=20) Mean ± SD	0.5% Ropivacaine + Dexmedetomidine Group (n=20) Mean ± SD	p value
Heart rate (beats/min)	78.6 ± 6.9	77.9 ± 7.2	0.74
Systolic blood pressure (mmHg)	122.8 ± 8.6	121.9 ± 9.1	0.71
Diastolic blood pressure (mmHg)	78.4 ± 6.3	79.1 ± 5.9	0.68
SpO_2 (%)	99.1 ± 0.6	99.0 ± 0.5	0.55

Description:
Table 3 demonstrates that baseline cardiovascular and respiratory parameters were comparable between the two groups. Mean heart rate was 78.6 ± 6.9 beats/min in the ropivacaine group and 77.9 ± 7.2 beats/min in the ropivacaine–dexmedetomidine group (p = 0.74). Mean systolic blood pressure was 122.8 ± 8.6 mmHg and 121.9 ± 9.1 mmHg, respectively (p = 0.71), while mean diastolic blood pressure was 78.4 ± 6.3 mmHg and 79.1 ± 5.9 mmHg (p = 0.68). Baseline oxygen saturation was also similar, at 99.1 ± 0.6% versus 99.0 ± 0.5% (p = 0.55). All p values were >0.05, confirming that there was no statistically significant baseline hemodynamic difference between the groups.

Table 4. Comparison of Duration of Analgesia

Study group	Duration of analgesia (hours), Mean ± SD	p value
0.5% Ropivacaine	6.8 ± 1.4	<0.001
0.5% Ropivacaine + Dexmedetomidine (0.5 µg/kg)	14.6 ± 2.3	

Description:
Table 4 shows a marked difference in the duration of postoperative analgesia. Patients receiving 0.5% ropivacaine alone had a mean analgesia duration of 6.8 ± 1.4 hours, whereas patients receiving 0.5% ropivacaine combined with dexmedetomidine (0.5 µg/kg) had a substantially longer mean duration of 14.6 ± 2.3 hours. The difference was highly statistically significant (p < 0.001). Thus, addition of dexmedetomidine was associated with an increase of approximately 7.8 hours in mean analgesia duration.

Table 5. Postoperative VAS Pain Scores at Different Time Intervals

Postoperative time	0.5% Ropivacaine Group (n=20) Mean ± SD	0.5% Ropivacaine + Dexmedetomidine Group (n=20) Mean ± SD	p value
1 hour	2.1 ± 0.6	2.0 ± 0.5	0.62
4 hours	3.4 ± 0.8	2.8 ± 0.7	0.06
8 hours	4.8 ± 0.9	3.1 ± 0.8	<0.001
12 hours	6.2 ± 1.0	3.6 ± 0.9	<0.001
24 hours	5.4 ± 0.9	2.9 ± 0.7	<0.001

Description:

Table 5 compares postoperative pain intensity using VAS at different postoperative intervals. At 1 hour, VAS scores were comparable between the groups (2.1 ± 0.6 vs 2.0 ± 0.5; p = 0.62). At 4 hours, the dexmedetomidine group demonstrated a lower mean VAS score (2.8 ± 0.7 vs 3.4 ± 0.8), although the difference was not statistically significant (p = 0.06). From 8 hours onward, significantly lower pain scores were observed in the ropivacaine–dexmedetomidine group: 3.1 ± 0.8 vs 4.8 ± 0.9 at 8 hours, 3.6 ± 0.9 vs 6.2 ± 1.0 at 12 hours, and 2.9 ± 0.7 vs 5.4 ± 0.9 at 24 hours, with all differences statistically significant (p < 0.001).

Table 6. Postoperative Analgesic Consumption

Postoperative time	0.5% Ropivacaine Group (n=20) Mean ± SD	0.5% Ropivacaine + Dexmedetomidine Group (n=20) Mean ± SD	p value
1 hour	2.1 ± 0.6	2.0 ± 0.5	0.62
4 hours	3.4 ± 0.8	2.8 ± 0.7	0.06
8 hours	4.8 ± 0.9	3.1 ± 0.8	<0.001
12 hours	6.2 ± 1.0	3.6 ± 0.9	<0.001
24 hours	5.4 ± 0.9	2.9 ± 0.7	<0.001

Description:
Table 6 demonstrates the postoperative analgesic-sparing effect associated with dexmedetomidine. Mean total postoperative analgesic consumption was 412.5 ± 58.4 mg in the ropivacaine-alone group compared with 286.3 ± 46.9 mg in the ropivacaine–dexmedetomidine group (p < 0.001). Similarly, the mean number of rescue analgesic doses was reduced from 2.8 ± 0.6 in the ropivacaine group to 1.4 ± 0.5 in the combination group (p < 0.001).

Table 7. Time to First Rescue Analgesic

Study group	Time to first rescue analgesic (hours), Mean ± SD	p value
0.5% Ropivacaine	7.2 ± 1.5	<0.001
0.5% Ropivacaine + Dexmedetomidine	15.2 ± 2.4	

Description:
Table 7 compares the time interval from completion of the block to administration of the first rescue analgesic. Patients receiving 0.5% ropivacaine alone required rescue analgesia after 7.2 ± 1.5 hours, whereas those receiving the combination of ropivacaine and dexmedetomidine required their first rescue analgesic after 15.2 ± 2.4 hours. The difference was highly statistically significant (p < 0.001), demonstrating a substantially prolonged analgesic period with the addition of dexmedetomidine.

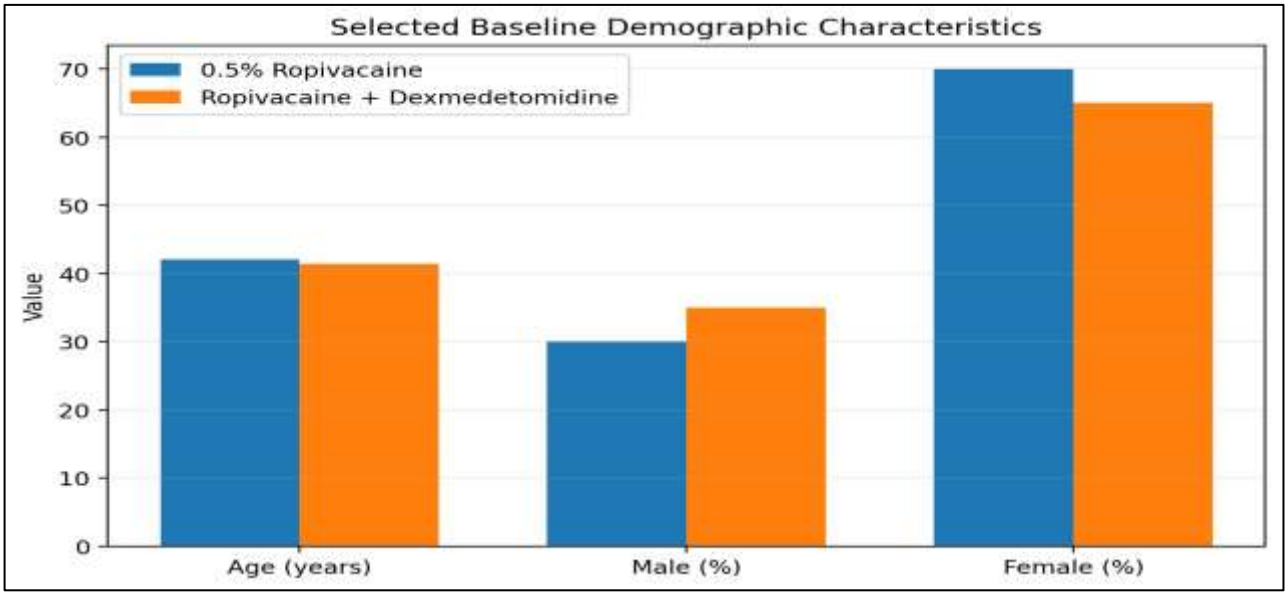

Figure 1. Comparison of Baseline Demographic and Clinical Characteristics Between the Study Groups

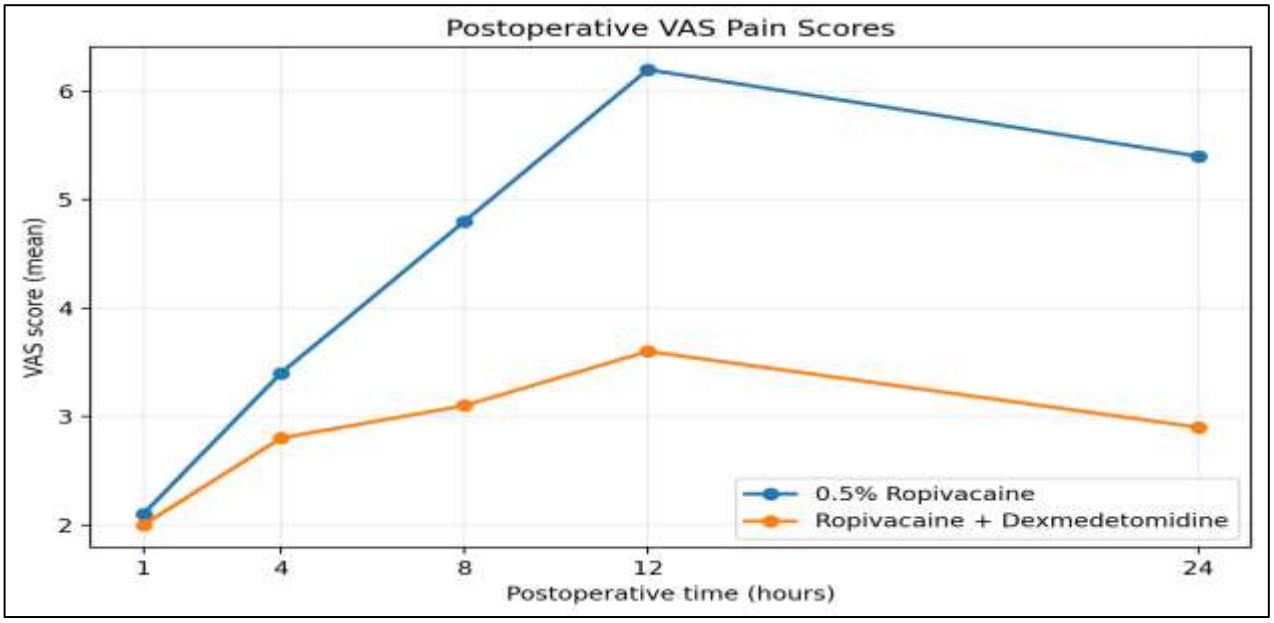

Figure 2. Comparison of Postoperative VAS Pain Scores at Different Time Intervals Between the Study Groups

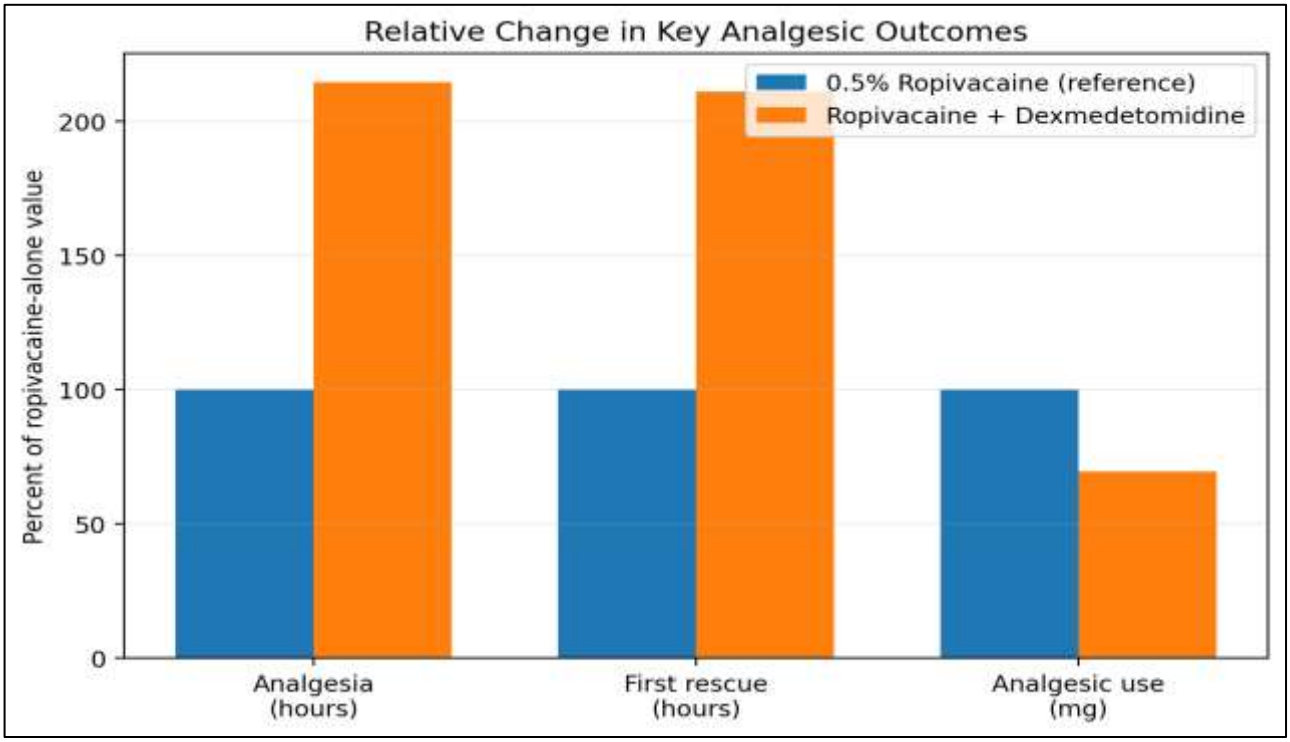

Figure 3. Comparison of Key Postoperative Analgesic Outcomes Between the Study Groups

DISCUSSION

The present study demonstrated a significant prolongation of postoperative analgesia with the addition of dexmedetomidine to ropivacaine. Mean analgesia duration increased from 6.8 ± 1.4 hours with 0.5% ropivacaine alone to 14.6 ± 2.3 hours with ropivacaine plus dexmedetomidine ($p < 0.001$). This finding is consistent with Santosh et al., who reported significantly prolonged analgesia and delayed rescue analgesic requirement when dexmedetomidine was added to superficial cervical plexus block for thyroid surgery [11]. The direction and magnitude of benefit in the present study therefore support their conclusion that dexmedetomidine enhances the duration of cervical plexus block.

Similarly, Lin et al. demonstrated improved block characteristics following addition of dexmedetomidine to ropivacaine for cervical plexus block [12]. In the present study, the clinically important increase in analgesia duration from 6.8 to 14.6 hours provides direct evidence of this prolonged effect using a weight-based dexmedetomidine dose of 0.5 µg/kg.

Jain et al. evaluated 0.25% ropivacaine with dexmedetomidine versus dexamethasone as adjuvants for BSCPB during thyroidectomy and reported improved postoperative analgesic efficacy with adjuvant therapy [13]. Although their ropivacaine concentration and comparator adjuvant differed from the present study, their findings are consistent with the present observation of enhanced analgesia following addition of dexmedetomidine.

The present study also demonstrated significantly reduced postoperative analgesic requirements. Total analgesic consumption decreased from 412.5 ± 58.4 mg with ropivacaine alone to 286.3 ± 46.9 mg with dexmedetomidine ($p <$

0.001), while rescue analgesic doses decreased from 2.8 ± 0.6 to 1.4 ± 0.5 doses ($p < 0.001$). These findings agree with the systematic review and meta-analysis by Wilson et al., which supported BSCPB as an effective technique for reducing postoperative pain and analgesic requirements following thyroid surgery [14].

The findings are further supported by Schnabel et al., whose meta-analysis and trial sequential analysis demonstrated prolonged analgesia and reduced postoperative analgesic requirements with dexmedetomidine as an adjuvant to peripheral nerve blocks [15]. The present study provides procedure-specific confirmation, with a reduction in total analgesic requirement of approximately 126.2 mg between groups.

Vorobeichik et al. reported that perineural dexmedetomidine significantly prolonged sensory block and delayed rescue analgesia in peripheral nerve blocks [16]. Consistently, the present study showed that the time to first rescue analgesic increased from 7.2 ± 1.5 hours in the ropivacaine group to 15.2 ± 2.4 hours in the dexmedetomidine group ($p < 0.001$), an increase of approximately 8 hours.

Likewise, Abdallah et al. reported prolonged sensory and motor blockade with perineural dexmedetomidine, with their meta-analysis estimating an increase of approximately 284 minutes in sensory block duration and 268 minutes in motor block duration compared with local anaesthetic alone [17]. The present study demonstrated an even larger clinical difference in analgesia duration, increasing by approximately 7.8 hours (468 minutes). However, these outcomes should not be considered directly equivalent because Abdallah et al. evaluated multiple peripheral nerve block techniques and different dexmedetomidine regimens, whereas the present study specifically evaluated BSCPB in thyroid surgery.

The present study found significantly lower VAS pain scores with dexmedetomidine at later postoperative time points. At 1 hour, VAS was 2.1 ± 0.6 versus 2.0 ± 0.5 ($p = 0.62$), and at 4 hours, it was 3.4 ± 0.8 versus 2.8 ± 0.7 ($p = 0.06$). From 8 hours onward, the difference became statistically significant: 4.8 ± 0.9 versus 3.1 ± 0.8 at 8 hours, 6.2 ± 1.0 versus 3.6 ± 0.9 at 12 hours, and 5.4 ± 0.9 versus 2.9 ± 0.7 at 24 hours, with $p < 0.001$ at all three time points. These findings are compatible with the analgesic benefits reported by Li et al. in their meta-analysis of different dexmedetomidine concentrations used with local anaesthetics [18], although their study involved erector spinae plane block rather than cervical plexus block.

Liu et al. reported that low-dose dexmedetomidine used as a perineural adjuvant prolonged postoperative analgesia and delayed rescue analgesic requirement [19]. The present study similarly demonstrated a delay in rescue analgesia from 7.2 ± 1.5 to 15.2 ± 2.4 hours, supporting the effectiveness of a relatively low weight-based dose of 0.5 μg/kg.

Cai et al., in their meta-analysis of 57 randomized clinical trials, evaluated the dose of perineural dexmedetomidine required to prolong analgesia [20]. Their findings support the dose-dependent analgesic effect of dexmedetomidine. The present study demonstrated substantial benefit with 0.5 μg/kg; however, because only one dose was evaluated, an optimal dose or dose-response relationship cannot be established from the present study.

The present findings are also consistent with the review by Desai et al., which describes peripheral nerve block adjuvants as a strategy for prolonging block duration and improving postoperative analgesia [21]. In the present study, this effect was demonstrated clinically through prolonged analgesia, reduced rescue analgesic consumption and lower late postoperative VAS scores.

Chen et al. similarly reviewed dexmedetomidine as an adjuvant in peripheral nerve blocks and supported its ability to enhance the duration and quality of analgesia [22]. The present results provide further clinical support, with analgesia duration more than doubling from 6.8 ± 1.4 to 14.6 ± 2.3 hours following addition of dexmedetomidine.

Regarding the block technique, Syal et al. compared ultrasound-guided cervical plexus block techniques for postoperative analgesia following total thyroidectomy [23]. The present study similarly used ultrasound guidance, with a 10–15 MHz linear probe, a 22-gauge needle, and an in-plane approach to the fascial plane between the sternocleidomastoid muscle and investing layer of the deep cervical fascia. Thus, the use of ultrasound-guided standardized block administration in the present study is consistent with contemporary cervical regional anaesthesia practice.

Kannan et al. evaluated BSCPB during thyroid surgery and reported benefits in perioperative anaesthetic and analgesic management [24]. In the present study, the principal benefit was postoperative, with total analgesic consumption falling from 412.5 ± 58.4 to 286.3 ± 46.9 mg ($p < 0.001$) and rescue analgesic doses from 2.8 ± 0.6 to 1.4 ± 0.5 ($p < 0.001$).

Finally, Shih et al. demonstrated beneficial postoperative analgesic effects of bilateral superficial cervical plexus block combined with general anaesthesia during thyroid surgery [25]. The present study extends these findings by specifically comparing ropivacaine alone with ropivacaine plus dexmedetomidine, demonstrating that the addition of dexmedetomidine significantly prolongs analgesia and reduces postoperative analgesic requirements.

Overall, the present study showed a clear and consistent analgesic advantage with dexmedetomidine: analgesia duration increased by 7.8 hours, first rescue analgesia was delayed by 8.0 hours, total analgesic consumption decreased by 126.2 mg, and rescue analgesic doses were reduced by 1.4 doses. These improvements were accompanied by significantly lower VAS scores from 8 to 24 hours and greater patient satisfaction, supporting dexmedetomidine 0.5 μg/kg as a useful adjuvant to 0.5% ropivacaine for BSCPB in thyroid surgery.

CONCLUSION

In patients undergoing thyroid surgery, bilateral superficial cervical plexus block with 0.5% ropivacaine combined with dexmedetomidine 0.5 μg/kg provided significantly better postoperative analgesia than 0.5% ropivacaine alone. The addition of dexmedetomidine increased the mean duration of analgesia from 6.8 ± 1.4 to 14.6 ± 2.3 hours and delayed the first rescue analgesic requirement from 7.2 ± 1.5 to 15.2 ± 2.4 hours. It also significantly reduced total postoperative analgesic consumption and the number of rescue analgesic doses. Pain scores were significantly lower at 8, 12 and 24 hours, while excellent patient satisfaction was higher in the dexmedetomidine group. Postoperative haemodynamic parameters remained comparable between groups, although greater early sedation was observed with dexmedetomidine.

Overall, dexmedetomidine appears to be an effective adjuvant to ropivacaine for bilateral superficial cervical plexus block, providing prolonged and clinically meaningful postoperative analgesia following thyroid surgery.

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