Original Research Paper

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COMPARISON OF ROPIVACAINE ALONE AND WITH DEXMEDETOMIDINE OR DEXAMETHASONE IN BILATERAL SUPERFICIAL CERVICAL PLEXUS BLOCK (BSCPB) FOR POSTOPERATIVE ANALGESIA, BLOOD LOSS AND QUALITY OF SURGICAL FIELD IN THYROID SURGERIES.

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ABSTRACT **Background:** Thyroidectomy is associated with moderate postoperative pain. Bilateral superficial cervical plexus block (BSCPB) improves postoperative analgesia. The addition of dexmedetomidine or dexamethasone to ropivacaine may prolong analgesia and improve surgical conditions. **Aim:** To compare dexmedetomidine (50 µg) and dexamethasone (4 mg) as adjuncts to ropivacaine in ultrasound-guided BSCPB in patients undergoing thyroidectomy. **Methods:** Forty-five ASA I and II patients undergoing total thyroidectomy were randomized into three groups (n=15 each). Group A: Ropivacaine 20 ml + saline Group B: Ropivacaine 20 ml + dexmedetomidine 50 µg Group C: Ropivacaine 20 ml + dexamethasone 4 mg Postoperative pain was assessed using VAS for 12 hours. Time to first rescue analgesia, total analgesic consumption, intraoperative hemodynamics, blood loss, and surgical field grading were recorded. **Results:** Mean time to first rescue analgesia was 182 ± 28 minutes in Group A, 458 ± 52 minutes in Group B, and 372 ± 46 minutes in Group C ($p < 0.001$). Total paracetamol consumption in 12 hours was 1.8 ± 0.4 g in Group A, 0.8 ± 0.3 g in Group B, and 1.0 ± 0.3 g in Group C ($p < 0.001$). Mean VAS scores at 6 hours were 4.6 ± 0.8 (Group A), 2.1 ± 0.6 (Group B), and 2.8 ± 0.7 (Group C) ($p < 0.001$). Intraoperative blood loss was lowest in Group B (72 ± 18 ml) compared to Group C (88 ± 20 ml) and Group A (104 ± 22 ml) ($p = 0.02$). Hemodynamic parameters remained stable in all groups. **Conclusion:** Dexmedetomidine and dexamethasone significantly prolong analgesia when added to ropivacaine in BSCPB. Dexmedetomidine provides longer duration of analgesia and better surgical field quality compared to dexamethasone.

KEYWORDS : Bilateral Superficial Cervical Plexus Block, Ropivacaine, Dexmedetomidine, Dexamethasone, Thyroidectomy Analgesia.

INTRODUCTION

Thyroidectomy is associated with significant postoperative pain despite being performed under general anesthesia. Nearly 90% of patients require morphine within the first 24 hours, and the mean pain score during this period has been reported as 6.9 on a 10-point visual analog scale (VAS) (1).

Regional techniques such as bilateral superficial cervical plexus block (BSCPB) are increasingly used to improve postoperative analgesia. Although continuous catheter techniques can prolong block duration, they require close monitoring and are associated with complications such as catheter displacement and infection. The addition of adjuvants such as dexmedetomidine and dexamethasone to local anesthetics has been shown to prolong the duration of analgesia(2).

Perineural dexmedetomidine prolongs sensory and motor block duration, reduces postoperative analgesic requirement, and improves pain control by inhibiting substance P release and enhancing hyperpolarization of nerve fibers. However, higher doses (150 µg) have been associated with sedation and paresthesia; therefore, doses not exceeding 100 µg are recommended(2). In this study, 50 µg dexmedetomidine was used as an adjunct to ropivacaine.

Dexamethasone prolongs analgesia by reducing local anesthetic absorption through vasoconstriction and by suppressing nociceptive transmission. A ceiling dose of 4 mg has been shown to extend analgesia by approximately 6–8 hours when combined with local anesthetics(3).

This study was designed to compare the analgesic efficacy of ultrasound-guided BSCPB using ropivacaine (20 ml) alone and in combination with dexmedetomidine (50 µg) or dexamethasone (4 mg) in patients undergoing thyroidectomy.

The primary outcome was duration of analgesia (time to first rescue analgesia). Secondary outcomes included VAS scores, total analgesic consumption, intraoperative blood loss, and hemodynamic parameters.

MATERIALS AND METHODS

A prospective randomized comparative interventional study involving 45 patients in 3 groups undergoing total thyroidectomy surgeries admitted in a tertiary care hospital in Mangalore, Karnataka.

Sampling Method: simple random sampling

Study Period: From the time of Institutional ethical committee (FMIEC) clearance for a period of 6 months

Sample Size: Three groups of subjects, 15 in each group.

The following formula was used to obtain the sample size 'n'

$$n = 2\frac{(Z\alpha + Z\beta)2\sigma 2}{(X1 - X2)2}$$

$Z\alpha = 1.96$ (at 95% confidence interval)

$Z\beta = 1.281$ (at 90% power)

$X1 \pm \sigma 1 = 29.6 \pm 17.8$

$X2 \pm \sigma 2 = 13.5 \pm 6.3$

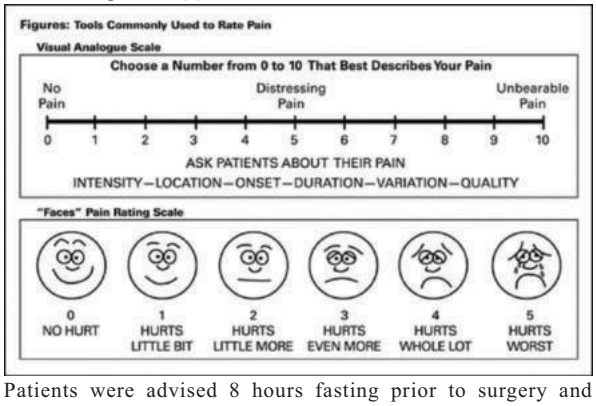
Statistical Analysis

The collected data was analyzed by mean, standard deviation and ANOVA test.

Study Procedure

Forty-five adult patients belonging to ASA physical status 1 and 2 scheduled to undergo thyroid surgeries under general anaesthesia were included in the study after ethical clearance.

Thorough preoperative evaluation of the patient was done on the day before surgery. After taking written informed consent, baseline heart rate and blood pressure were noted. Basic investigations like complete hemogram, random blood glucose levels, ECG, renal function test, thyroid function tests were noted. The visual analogue scale (VAS) score was explained. (9)



Patients were advised 8 hours fasting prior to surgery and premedicated with oral tablet Pantoprazole 40mg on the night prior to surgery.

The study included patients aged 18 years and above, with ASA physical status I or II, who were euthyroid at the time of surgery.

Patients were excluded if they had a known drug allergy or contraindication, coagulopathy, local infection at the block site, neurological deficits, psychiatric illness, or were on chronic analgesic therapy.

Patients were divided to three groups of 15 each using sealed envelope technique, receiving one of the following for USG guided BSCPB immediately after induction of GA:

1. Group A(n=15)-Ropivacaine(20ml) with 1 ml normal saline
2. Group B (n=15)-Ropivacaine (20ml) with dexmedetomidine (50mcg)-diluted to 1ml with normal saline
3. Group C (n=15)-Ropivacaine(20ml) with dexamethasone(4mg)-1ml.

Baseline heart rate, non-invasive blood pressure, SPO2 were recorded using multi parameter monitor, before starting the procedure. A working IV cannula was ensured. Injection fentanyl 2mcg/kg was administered followed by pre-oxygenation with 100% oxygen for 3 minutes, induced with propofol 2mg/kg and neuromuscular blockade was provided by succinylcholine 1.5mg/kg,after confirming adequate mask ventilation. Patients were intubated using an appropriate size cuffed endotracheal tube, pilot balloon inflated and bilateral equal air entry will be confirmed. Vecuronium bolus dose 0.1mg/kg was given and positive pressure ventilation initiated. Anaesthesia was maintained with O2, N2O, isoflurane (at 1 MAC) and vecuronium 0.02mg/kg top ups done when train of four count >3, by using a neuromuscular monitoring device.

The SCPB was performed under USG guidance with 26G hypodermic needle using high frequency probe, with patient in supine position using the three point technique where the drug was injected sub-fascially, deep to the posterior border of sternocleidomastoid muscle, at the midpoint and along its length above and below from the insertion point (5). Needle was placed above the scalene muscles and beneath the pre-vertebral fascia.

At the end of surgery patients were extubated with full reversal using 0.05mg/kg neostigmine and 0.02mg/kg glycopyrrolate and then transferred to postoperative ward.

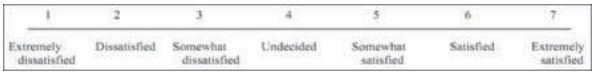
Intraoperatively heart rate, non-invasive blood procedure, SPO2, EtCO2 were assessed every 10 minutes till extubation. Inj Fentanyl 0.5mcg/kg was given as top up if BP increased more than 20% of the baseline, after ruling out lighter planes of anaesthesia. Postoperative pain was assessed using 0-10 VAS at every 1hour for 1st 6 hours and every 2 hours for the next 6 hours. Inj PCT 1g IV was used as rescue analgesic when VAS score >3 in all the groups and the time of administration was noted. Surgical field was assessed using a predefined category scale adopted from Fromme et al. (10)

Average category scale for assessment of intraoperative surgical field:
0- No bleeding.
1- Slight bleeding – no suctioning of blood required.
2- Slight bleeding – occasional suctioning required. Surgical field not threatened.
3- Slight-bleeding – frequent suctioning required. Bleeding threatens surgical field a few seconds after suction is removed.
4- Moderate bleeding – frequent suctioning required. Bleeding threatens surgical field directly after suction is removed.
5- Severe bleeding – constant suctioning required.

Bleeding appears faster than can be removed by suction. Surgical field severely threatened and surgery not possible.

The total blood loss measured from suction catheter and soaked gauzes was calculated at the end of procedure.

Seven-point Likert type verbal rating scale for patient or surgeon satisfaction



RESULTS

All 45 patients completed the study. Demographic variables including age, gender, weight, ASA status, and duration of surgery were comparable among groups ($p > 0.05$) as shown in Table 1.

Table 1: Demographic Characteristics

Parameter	Group A (n=15)	Group B (n=15)	Group C (n=15)	p-value
Age (years)	42.6 ± 8.4	41.8 ± 7.9	43.2 ± 8.1	0.89
Weight (kg)	62.4 ± 6.2	63.1 ± 5.8	61.9 ± 6.5	0.78
Gender (M/F)	4/11	5/10	3/12	0.81
Duration of surgery (min)	118 ± 14	121 ± 16	116 ± 13	0.67
ASA I/II	9/6	8/7	10/5	0.84

Postoperative Pain (VAS Scores)

Table 2: Postoperative VAS Scores

Time (hours)	Group A	Group B	Group C	p-value
1 hour	3.2 ± 0.7	1.4 ± 0.5	1.8 ± 0.6	<0.001
2 hours	3.8 ± 0.8	1.6 ± 0.5	2.1 ± 0.6	<0.001
4 hours	4.3 ± 0.9	1.9 ± 0.6	2.5 ± 0.7	<0.001
6 hours	4.6 ± 0.8	2.1 ± 0.6	2.8 ± 0.7	<0.001
8 hours	4.2 ± 0.7	2.0 ± 0.5	2.6 ± 0.6	<0.001
12 hours	3.8 ± 0.7	1.9 ± 0.5	2.4 ± 0.6	<0.001

VAS scores were significantly lower in Groups B and C compared to Group A at 4, 6, 8, and 12 hours ($p < 0.001$). Group B showed significantly lower VAS scores than Group C at 6 and 12 hours ($p < 0.05$). This is shown in Table 2.

Time to First Rescue Analgesia

The mean time to first rescue analgesia was 182 ± 28 minutes in Group A, 458 ± 52 minutes in Group B, and 372 ± 46 minutes in Group C, with the difference being statistically significant ($p < 0.001$); the longest duration of analgesia was observed in Group B.

The total analgesic consumption during the first 12 hours was 1.8 ± 0.4 g in Group A, 0.8 ± 0.3 g in Group B, and 1.0 ± 0.3 g in Group C, showing a statistically significant reduction in Groups B and C compared to Group A ($p < 0.001$).

Intraoperative Hemodynamics

Table 3: Intraoperative Haemodynamic Parameters

Parameter	Group A	Group B	Group C	p-value
Mean Heart Rate (bpm)	76 ± 7	68 ± 6	72 ± 6	0.04
Mean MAP (mmHg)	86 ± 5	82 ± 6	84 ± 5	0.08

Mean heart rate and mean arterial pressure remained within 20% of baseline in all groups. Group B showed lower mean heart rate intraoperatively (68 ± 6 bpm) compared to Group A (76 ± 7 bpm) and Group C (72 ± 6 bpm) ($p = 0.04$). This is as shown in Table 3. No intervention was required for bradycardia or hypotension.

Blood Loss and Surgical Field

Table 4: Blood Loss and Surgical Field

Parameter	Group A	Group B	Group C	p-value
Blood loss (ml)	104 ± 22	72 ± 18	88 ± 20	0.02
Fromme Score	2.8 ± 0.6	1.6 ± 0.5	2.1 ± 0.6	<0.01

The mean intraoperative blood loss was 104 ± 22 ml in Group A, 72 ± 18 ml in Group B, and 88 ± 20 ml in Group C, with the difference being statistically significant ($p = 0.02$).

The mean Fromme surgical field score was 2.8 ± 0.6 in Group A, 1.6 ± 0.5 in Group B, and 2.1 ± 0.6 in Group C, indicating significantly better surgical field quality in Group B ($p < 0.01$). This is shown in Table 4.

No major adverse events were observed in any of the groups.

DISCUSSION

This study demonstrates that the addition of dexmedetomidine or dexamethasone to ropivacaine in bilateral superficial cervical plexus block (BSCPB) significantly improves postoperative analgesia following thyroidectomy. The time to first rescue analgesia was longest in the dexmedetomidine group (458 ± 52 min), followed by dexamethasone (372 ± 46 min) and ropivacaine alone (182 ± 28 min), indicating superior prolongation with dexmedetomidine. Correspondingly, VAS scores were consistently lower in the adjuvant groups, particularly beyond 6 hours postoperatively, with dexmedetomidine achieving the lowest pain scores. Total analgesic consumption was also significantly reduced in both adjuvant groups, with the minimal requirement observed in the dexmedetomidine group.

Intraoperative blood loss was lower and surgical field quality better in

the dexmedetomidine group, likely reflecting improved hemodynamic stability and reduced sympathetic response. No significant complications were observed, suggesting that both adjuvants are safe at the studied doses.

These findings align with previous literature. Zemedu Aweke (2017) reported that BSCPB significantly reduced postoperative pain scores, total analgesic consumption, and time to first analgesic request (4). Santhosh and Mehandale (2016) found that adding dexmedetomidine to ropivacaine prolonged analgesia and lowered VAS scores at 12 and 24 hours without affecting hemodynamics (5). Elbahrawy (2018) demonstrated that perineural dexamethasone decreased the need for rescue analgesics and delayed their first use (6). Similarly, studies by Shih et al. (2010) and Andrieu et al. (2007) reported that BSCPB reduced intraoperative anesthetic requirements and postoperative pain, particularly when adjuvants such as clonidine or local anesthetics were used (7,8). Conversely, Herbland (2006) noted that BSCPB with ropivacaine alone did not prevent postoperative pain, highlighting the importance of adjuvant use (1).

Overall, the results support the use of dexmedetomidine or dexamethasone as effective adjuvants to ropivacaine in BSCPB to prolong analgesia, reduce postoperative analgesic requirements, and improve surgical conditions in thyroidectomy.

CONCLUSION

Addition of dexmedetomidine (50 µg) or dexamethasone (4 mg) to ropivacaine in ultrasound-guided BSCPB significantly prolongs postoperative analgesia and reduces analgesic consumption following thyroidectomy. Dexmedetomidine provides longer duration of analgesia, lower pain scores, reduced blood loss, and better surgical field quality compared to dexamethasone.

Conflicts of Interest: None

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