Original Research

A COMPARATIVE STUDY OF EFFICACY OF TWO DOSES OF DEXMEDETOMIDINE AS ADJUVANT TO ROPIVACAINE IN ULTRASOUND- GUIDED AXILLARY BRACHIAL PLEXUS BLOCK FOR ELECTIVE FOREARM SURGERIES – A PROSPECTIVE DOUBLE-BLIND RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background: Perioperative and postoperative pain control is one of the most challenging issues. Despite innovations in the field of anesthesia and surgery, postoperative pain is an inevitable problem[1,2]. **Objective:** to compare the two dosages of dexmedetomidine as an adjuvant with 0.75% ropivacaine to obtain optimal analgesia with minimum side effects. **Methods:** This Prospective double-blinded randomized controlled trial **was conducted among** patients of all sexes coming to Central Hospital South Eastern Railway Hospital, Kolkata for elective upper limb surgeries during the study period 1 year (December 2023 to November 2024). **Result:** Both the onset of sensory and motor blockade were also significantly prolonged with higher doses of dexmedetomidine at $p<0.05$. The onset of sensory block of Group A and Group B were 9.68±1.59 min and 6.50±1.14 min respectively. The onset of motor block in Group A was 12.5±1.44 min and in Group B was 8.68±1.04 min. Duration of sensory block was prolonged in a higher dose of dexmedetomidine (Group A-1µg/kg dexmedetomidine vs Group B-2µg/kg dexmedetomidine: 756.14±111.43 min vs 884.09±93.49 min, $p<0.001$). Duration of motor block was also significantly prolonged in Group B than in Group A (Group A-1µg dexmedetomidine vs Group B-2µg dexmedetomidine: 848.41±89.67 min vs 909.55±87.78 min, $p=0.027$).
Conclusion: Even though the higher dose of dexmedetomidine improves block characteristics, 1µg/kg dose of dexmedetomidine can be considered the optimal dose as adjuvant to ropivacaine considering the minimal hemodynamic instability in peripheral nerve block.

Keywords: Dexmedetomidine, Adjuvant, Ropivacaine, Ultrasound-Guided Axillary Brachial Plexus Block, Elective Forearm Surgery.

INTRODUCTION

Keeping the patient pain-free during and immediately following the surgery is of prime importance for the surgeon as well as anesthetists. The advent of regional anesthesia is one of the widely accepted approaches to keep the patients' pain-free for a relatively longer period as evidenced by many studies. Regional anesthesia techniques offer several advantages, including excellent pain control, reduced side effects from the usage of systemic analgesics (especially opioids), and the avoidance of the complications associated with general anesthesia, such as postoperative nausea, vomiting, sore throat, fatigue, and shorter stays in both the post- anesthesia care unit and the hospital overall with an eventual reduced economic burden.[1,2] Additionally, regional anesthesia reduces the risk of postoperative delirium in elderly patients.[3] The requirement of post-operative analgesics is delayed and the total dose of rescue analgesia is also required less. The additional side effects of opioid usage in the postoperative period can also be avoided to some extent. These advantages are short-lived due to the limited duration of action of local anesthetic drugs.[4] To avoid premature resolution of peripheral nerve blockade several methods have been tried. Increasing the volume (dose) of Local anesthetic (LA) drugs may prolong the duration of a block at the cost of elevated risk of LA systemic toxicity.[6] Using catheter-based nerve blocks can prolong post-operative analgesia but with a fair share of problems like the requirement of additional time, cost, and

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skill. Besides, providing continuous infusion through the catheter can also lead to infection.[1,5,6]

The brachial plexus block has become a crucial tool in an anesthesiologist's repertoire, offering a safe alternative to general anesthesia for upper limb surgeries and perioperative pain relief. Its growing popularity can be attributed to advancements in regional anesthesia, including improvements in local anesthetic drugs, the introduction of newer adjuvants, and the use of ultrasound for more precise and successful block administration.[1] Different approaches of brachial plexus block are inter scalene, supraclavicular, infraclavicular, and axillary. The axillary approach for brachial plexus block is popular because of its ease of accessibility, safety, and reliability in surgeries of the elbow, forearm, and hand. With the use of ultrasound (US) technology for guiding blocks, there is less risk of inadvertent complications during peripheral nerve blocks and the need for a lesser amount of drugs.[7,8]

Ropivacaine is a local anesthetic (LA) of the amine amide group. It is a long-acting LA similar in structure to Bupivacaine but has a safer cardiac profile and provides both effective motor & sensory blockade in an equivalent dosage. Dexmedetomidine is an α-2 adrenergic agonist that has been used as an adjuvant to Las.[9] It has been studied for increasing the quality & length of blocks. Dexmedetomidine has been used as an adjuvant with other local anesthetics for peripheral nerve blockade with a dose range of 0.5 to 2 mcg/hour. With this dose range, various side effects have been identified in various studies. However optimal dose of dexmedetomidine for brachial plexus block is still debatable which would provide a longer duration of analgesia with minimum considerable side effects.[10] Few studies have been conducted now exploring the optimal dosage of dexmedetomidine. The current study has been conducted to compare the two dosages of dexmedetomidine as an adjuvant with 0.75% ropivacaine to obtain optimal analgesia with minimum side effects.

MATERIAL AND METHODS

This Prospective double-blinded randomized controlled trial was conducted among patients of all sexes coming to Central Hospital South Eastern Railway Hospital, Kolkata for elective upper limb surgeries during the study period 1 year (December 2023 to November 2024).

Inclusion Criteria:

1. Age group 18 to 75 years
2. American Society of Anaesthesiologists (ASA) Physical status 1 and 2
3. Those who will give written informed consent

Exclusion Criteria:

1. Pregnancy
2. BMI >30
3. Pre-existing neuropathy involving surgical limb
4. Patients with bleeding disorders or on anticoagulant therapy
5. Patents with a local skin infection at the site of injection
6. Patients with known hypersensitivity to studied drugs
7. Unsuccessful or inadequate nerve block which will need to be converted to general anesthesia.

Arms and Interventions:

To maintain uniformity, we have used Ropivacaine 0.75% 20 ml ampoule (ROPIN™mfg by NEON). Dexmedetomidine 1 ml ampoule with 100mcg/ml strength (DEXTOMID™ mfg by NEON) has been used**.**

✓ Intervention/Treatment Group 1: Group A:
Patients received US-guided axillary nerve block using 20 ml of 0.75% Ropivacaine with 1mcg/kg dexmedetomidine with 0.9% NS to make the final volume 30 ml.

✓ Intervention/ Treatment Group 2: Group B:
Patients received US-guided axillary nerve block using 0.75% ropivacaine with 2mcg/kg dexmedetomidine diluted with 0.9% NS to make the final volume 30ml.

Sample Size Estimation:

A previous study aimed to find the efficacy of different doses of dexmedetomidine as an adjuvant (4), considering the primary outcome as the duration of analgesia (in min)

SD1 (Group A= Ropivacaine+ 1mcg/kg Dexmedetomidine) = 32.22 SD2 (Group B=Ropivacaine+ 2mcg/kg Dexmedetomidine) = 43.84

$$\text{Pooled SD} = \sqrt{\frac{SD_1^2 + SD_2^2}{2}}$$

Here, pooled SD= $\sqrt{(32.22)^2 + (43.84)^2 / 2} = 38.47$

Considering the above values, the calculated minimum sample size

$$= \frac{(1+1)(2.58+1.28)^2 \times (38.47)^2}{(60)^2} = 12.25 \approx 13$$

Considering the failure rate of nerve block as 30%, the sample size becomes 16.9 ≈ 17 Considering dropout rate of 20%, the final sample size came (n) = 17/0.8= 21.25≈ 22 So, for each group, 22 participants will be recruited after meeting the eligibility criteria.

- Randomization Technique:

Block randomization technique had been used in the study to randomize subjects in two groups in similar numbers. This was done by using an online tool **sealedenvelope™**. [11]

The tool has been fed with treatment group numbers (A&B), block sizes (multiples of number of treatment groups), and list length (total sample size of two groups). The tool then generated a list comprising random block sizes with a randomized sequence of treatment groups which were given to the clinician who prepared the drug according to the group selected. Then the clinician put the block and group details of the subject in a code-sealed envelope. The coded sealed envelope and the assigned drugs were handed over to the investigator along with the subject. The clinician was not part of the study. The patient and investigator will not be aware of the group allocations. By using multiple block sizes and randomization codes on sealed envelopes the selection biases are nullified. One example of the said randomization using the stated tool is attached as Annexure.

Study Tools:

i. Assessment of motor blockade: modified Bromage scale on a 3-point scale; 0- normal motor function with full extension and flexion of elbow, wrist, and fingers, 1- decreased motor strength with ability to move only fingers, 2- complete motor block with inability to move elbow, wrist, and fingers.

ii. Assessment of sensory blockade: pinprick test in the dermatome areas (grade 0- when sharp pin felt), grade 1 if analgesia and dull sensation felt), grade 2 (when patients felt no sensation)[12]

iii. Sedation will be assessed by modified Ramsay sedation (m-RSS) score[13]

Modified Ramsay Sedation Scale (m-RSS)	
Score	Interpretation
1	Awake and alert, minimal or no cognitive impairment
2	Awake but tranquil, purposeful responses to verbal commands at a conversational level
3	Appears asleep, purposeful responses to verbal commands at a conversational level
4	Appears asleep, purposeful responses to commands but at a louder level, requiring light glabeller tap or both
5	Asleep, sluggish purposeful responses only to loud verbal commands strong glabeller tap or both
6	Asleep, sluggish responses only to painful stimuli
7	Asleep, reflex withdrawal to painful stimuli only
8	Unresponsive to external stimuli, including pain

i. Visual analog scale (VAS) scale[14]

Study Method Preparation

Patients selected as per the mentioned inclusion and exclusion criteria underwent pre-anesthetic evaluation (PAC). After obtaining PAC fitness and written informed consent, the selected patient was randomized into two groups Group A and Group Bin a 1:1 ratio using a computer- generated randomization table (block randomization) performed by a clinician who was involved in the study. Group assignments were sealed in randomly generated coded closed envelopes. Patients did not know which group they belonged to. This was the first blinding.

The procedure was explained to patients in detail, including the post-operative VAS score for assessment of pain. The basic investigation recommended for ASA physical status 1 and 2 like complete blood count, random blood sugar, renal function, coagulation profile, viral serology, chest x-ray, and electrocardiogram were taken and reviewed.

All the patients were premedicated with an injection of Pantoprazole 40 mg before shifting the patient to the preoperative holding area. On arrival at the operation theatre standard monitors (NIBP, Pulse oximeter, ECG) were attached and baseline parameters were recorded. An 18 G IV cannulation was done in the contra-lateral upper limb and a drip of IVF will be started. All emergency equipment drugs and airway instruments were kept ready in case of any adverse event or failure of the block and requirement of general anaesthesia.

The drug preparation was done by another anaesthetist who was not involved in the study. Equal volumes of drugs were present in syringes so that no distinction could be made between groups.

PROCEDURE

The patient was positioned supine with their head turned 45º to the contralateral side; the ipsilateral arm was abducted 90º. The pectoralis major tendon is palpated as it inserts into the humerus, and the transducer was placed immediately distal to that point after proper antiseptic dressing and draping. Sliding the transducer proximally brought the axillary artery, conjoint tendon, and terminal branches of the brachial plexus into view. The median ulnar and radial nerves appeared as hyperechoic structures surrounding the axillary artery but the musculocutaneous nerve was seen between biceps and coracobrachialis away from the rest of the plexus. Using 26G needle1-2 ml LA solution was injected at the needle insertion site the block needle was inserted using the in-plane technique from lateral to the medial direction towards the brachial plexus. After confirming with the nerve stimulator, the prepared drug volume of 30 ml was administered around the brunches after negative aspirations to avoid accidental vascular needle puncture. The whole procedure in both groups was performed by a single experienced anesthesiologist.In case of failure of the block, the patient was put under general anesthesia or rescue block of the nerves spared and the patient was excluded from the study.

VAS score was assessed at baseline (0 h), and 4, 8, 12, and 24 hours after surgery which was explained preoperatively. When the VAS score of ≥ 4 was recorded for any patient, an Injection of Tramadol 2mg/kg (maximum 100mg) IV was given as rescue analgesia. Each of such doses was calculated as a single dose. The doses consumed in 24 hours have been recorded. The maximum allowable dose of Tramadol in 24 hours was 300 mg. For post-operative PONV and aspiration risk, all patients received Injection of Ondansatron 4 mg IV twice daily & Injection of Pantoprazole 40 mg IV once daily.

Statistical Analysis

After data collection, data were entered in Microsoft Excel version 19. Data were analyzed using Statistical Package for the Social Sciences (version 25; IBM Corp., Armonk, NY, USA). Normality was checked by histogram and Shapiro-Wilk test.

Differences in proportions were analyzed by Chi-square or Fischer Exact test. Continuous data were expressed in mean±standard deviation. Differences between mean were assessed using independent t-tests as they were normally distributed and were considered statistically significant if $p<0.05$.

RESULTS

Table 1. Distribution of study participants according to their background characteristics (n=44)

Background Characteristics				
Variables		**Group A (n=22)**	**Group B (n=22)**	**p-value**
Age (in years)		48.50±18.20	45.41±16.93	P=0.563
Sex	**Male**	11(55.0%)	9(45.0%)	χ^2= 0.367; df=1; P=0.545
	Female	11(45.8%)	13(54.2%)	
BMI		26.29±2.20	26.18±2.04	P=0.871
Duration of surgery (in min)		87.73±27.11	85.00±27.04	P=0.740
ASA PS 1		13(52.0%)	12(48.0%)	χ^2=0.093; df=1 P=1.000
ASA PS 2		9(47.4%)	10(52.6%)	

The mean age of Group A and Group B participants was 48.50±18.20 years (mean ±SD) and 45.41±16.93 years (mean±SD) respectively and this difference was not statistically significant (p=0.563). The distribution of the proportion of males and females in both groups was also comparable. The mean BMI of both groups as well as the mean duration of surgery was not statistically significant at p=0.05. The ASA physical status of patients in both groups was also comparable.

Table 2. Distribution of onset of sensory and motor block with Group A and Group B among the study participants (total n=44)

Variables	**Group A (n=22)**	**Group B (n=22)**	**p-value**
Onset of sensory block(min)	9.68±1.59	6.50±1.14	P<0.001
Onset of motor block(min)	12.5±1.44	8.68±1.04	P<0.001

An Independent sample t-test has been done, p-value <0.05 is considered significant

The onset of sensory block was earlier in Group B (6.50±1.14 min) than in Group A (9.68±1.59 min) and this difference was found to be statistically significant at p<0.001. Similarly, the onset of motor block occurred significantly earlier in Group B (8.68±1.04 min) than in Group A (12.5±1.44 min) at p<0.001.

Table 3. Distribution of study participants of both Group A and Group B according to the duration of sensory block, duration of motor block, and duration of analgesia (total n=44)

Variables	Group A (n=22)	Group B (n=22)	p-value
Duration of sensory block(min)	756.14±111.43	884.09±93.49	P<0.001*
Duration of motor block(min)	848.41±89.67	909.55±87.78	P=0.027*

An Independent sample t-test has been done, p-value <0.05 is considered significant.

The duration of sensory block in Group B was significantly longer (884.09±93.49 min) than in Group A (756.14±111.43 min) at p<0.001. It implies that Group B which received a higher dose (2µg/kg) of dexmedetomidine as an adjuvant to ropivacaine showed a longer period of a sensory block than Group A which received 1µg/kg of dexmedetomidine as an adjuvant. A similar finding was observed in the case of motor block also. The participants of Group B who received 2µg/kg dose of dexmedetomidine with ropivacaine experienced a significantly longer duration of the motor block than Group A who received 1µg/kg dose of dexmedetomidine with ropivacaine (Group A vs Group B: 848.41±89.67 min vs 909.55±87.78 min, p=0.027).

Group B participants who received 2µg/kg dose of dexmedetomidine as an adjuvant with ropivacaine showed a significantly prolonged duration analgesia than the Group A those who received 1µg/kg dose of dexmedetomidine with ropivacaine (Group A vs Group B: 823.64±95.98 min vs 926.14±86.77 min, p=0.001).

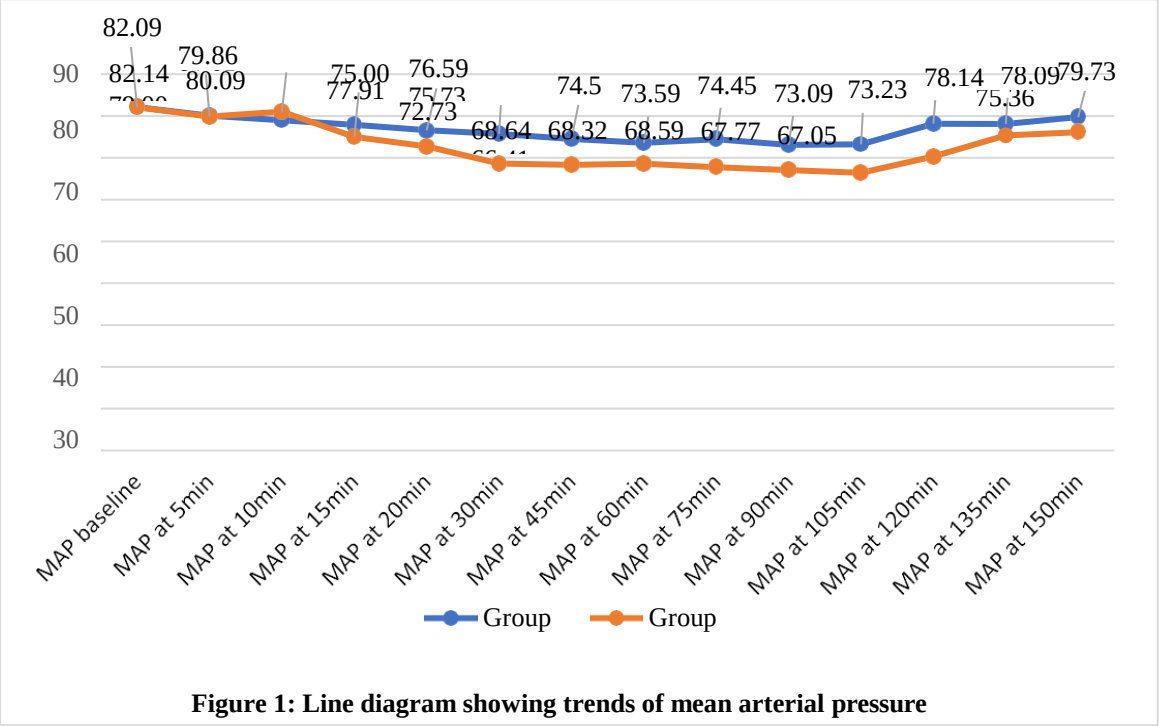


Figure 1: Line diagram showing trends of mean arterial pressure

Mean arterial pressure (MAP) from baseline and in the intraoperative period (every 5 minutes for initial 30 minutes) after that every 15 minutes. Here the trend of MAP variation has been shown over 150 minutes from baseline. It shows that the Group B patients showed a comparatively lower MAP starting from 20 minutes of initiation of block with dexmedetomidine as adjuvant and this trend persisted for almost 120 minutes thereafter.

At baseline the MAP was not statistically

significantly different between the two groups i.e., both the groups were comparable at baseline in terms of MAP. Till 15 minutes after giving the block with dexmedetomidine as an adjuvant to ropivacaine in two different doses in two groups, no significant difference in MAP was observed between the two groups. However, at 20 minutes, 30 minutes, 45 minutes, 60 minutes, 75 minutes, 90 minutes, 105 minutes, and 120 minutes, the MAP measured showed a significant difference between the two groups at $p<0.05$. From 20 minutes of block initiation, the Group B participants' MAP showed a significantly lower trend than the Group A who received a lower dose of dexmedetomidine (1µg/kg) as an adjuvant. Again, at 135 minutes and 150 minutes, the difference in MAP between the two groups did not show any significant difference at $p<0.05$.

Table 4. Comparison between the two groups according to occurrence of hypotension (Mean arterial pressure decrease >20%)

Time points	Group A Hypotension		Group B Hypotension		Inferential statistics
	Yes	No	Yes	No	
20 min	0 (0%)	22 (100%)	2 (9.1%)	20 (90.9%)	χ^2=2.095,df=1, p=0.488*
30 min	1 (4.5%)	21 (95.5%)	9 (40.9%)	13 (59.1%)	χ^2=8.282,df=1, p=0.009
45 min	2 (9.1%)	20 (90.9%)	7 (31.8%)	15 (68.2%)	χ^2=3.492,df=1, p=0.132*
60 min	1 (4.5%)	21 (95.5%)	7 (31.8%)	15 (68.2%)	χ^2=5.500,df=1, p=0.046*
75min	1 (4.5%)	21 (95.5%)	8 (36.4%)	14 (63.6%)	χ^2=6.844,df=1, p=0.021*
90 min	1 (4.5%)	21 (95.5%)	9 (40.9%)	13 (59.1%)	χ^2=8.282,df=1, p=0.009*
105 min	1 (4.5%)	21 (95.5%)	8 (36.4%)	14 (63.6%)	χ^2=6.844,df=1, p=0.011*
120 min	0 (0%)	22 (100%)	4 (18.2%)	18 (81.8%)	χ^2=4.400,df=1, p=0.108*
135 min	1 (4.5%)	21 (95.5%)	1 (4.5%)	21 (95.5%)	χ^2=.000,df=1, p=1.000*
150 min	2 (9.1%)	20 (90.9%)	3 (13.6%)	19 (86.4%)	χ^2=0.226,df=1, p=1.000*

Row percentage given,*Fischer Exact test done, p value <0.05 considered significant

We can observe that at 30 min, 60min, 75 min, 90min, and 105 min, the participants in Group B receiving the higher dose of dexmedetomidine than Group A experienced significant hypotension as denoted by a decrease of mean arterial pressure >20% from baseline MAP. Till 20 minutes we did not observe any significant difference in the decrease of MAP in both the groups and from 120 minutes onwards also, no significant change in MAP was observed between the two groups at $p<0.05$.

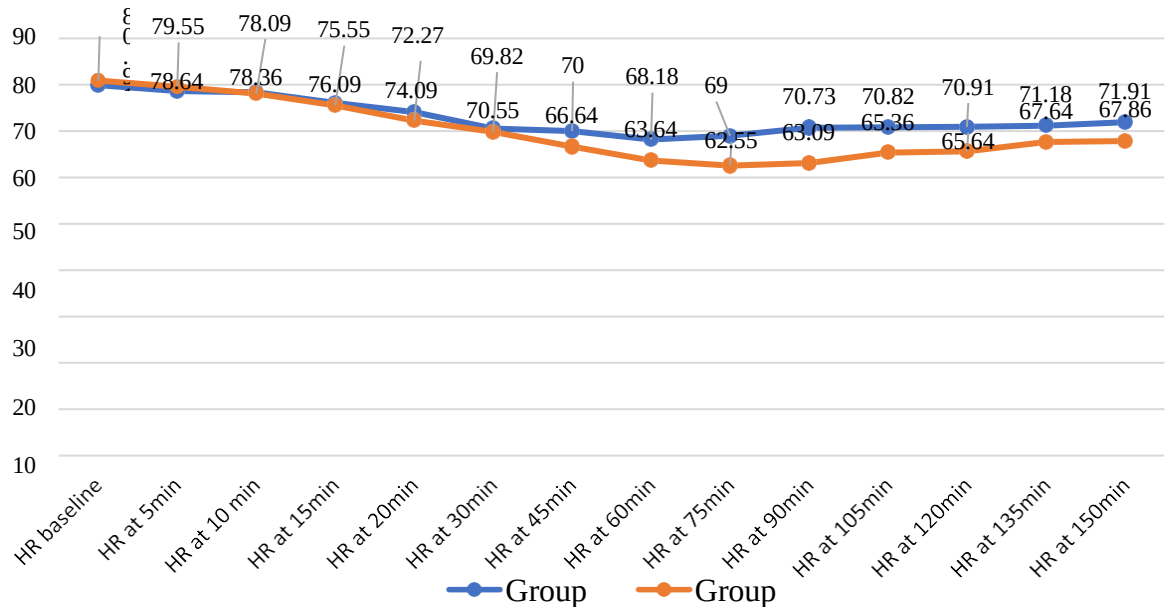


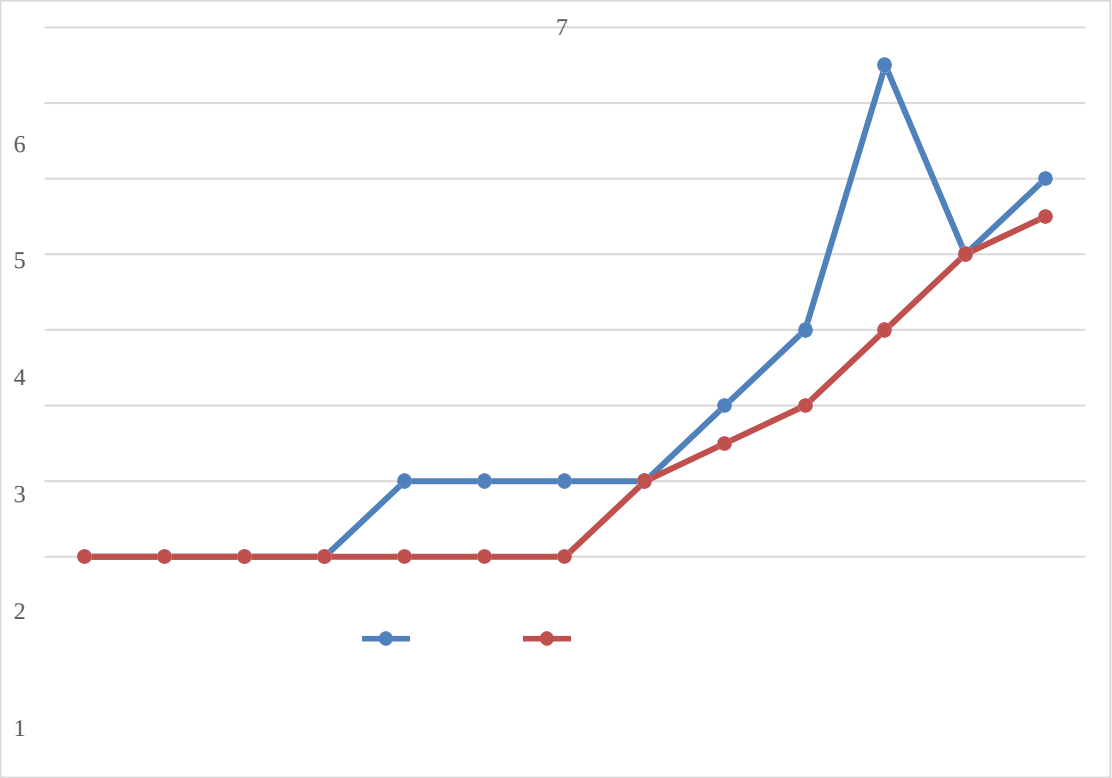
Figure 2. Line diagram showing trends of heart rate over

The Line diagram shows the trend of Heart rate (HR) starting from the baseline till 150 minutes after giving the axillary nerve block. From the line diagram, we can see that the mean HR of Group B (2µg/kg dose of dexmedetomidine as adjuvant) was lower than that of Group A (1µg/kg dose of dexmedetomidine as adjuvant), especially from 45 minutes till 150 minutes.

Table 5. Distribution of study participants according to the occurrence of bradycardia in both the groups (n=44)

	Group A		Group B		Inferential statistics
	Bradycardia	No bradycardia	Bradycardia	No bradycardia	
At 30 minutes	1 (4.5%)	21 (95.5%)	2 (9.1%)	20 (90.9%)	χ^2=0.358, df=1, p=1.000
At 45 minutes	2 (9.1%)	20 (90.9%)	6 (27.3%)	16 (72.7%)	χ^2=2.444, df=1, p=0.240
At 60 minutes	2 (9.1%)	20 (90.9%)	5 (22.7%)	17 (77.3%)	χ^2=1.529, df=1, p=0.412
At 75 minutes	1 (4.5%)	21 (95.5%)	6 (27.3%)	16 (72.7%)	χ^2=4.247, df=1, p=0.095
At 90 minutes	0 (0%)	22 (100%)	4 (18.2%)	40 (81.2%)	χ^2=4.400, df=1, p=0.108

The occurrence of bradycardia (HR<60/min) for the initial 150 minutes of block initiation. The study shows that at 30 minutes 2 participants from Group B and 1 participant from Group A experienced bradycardia. Whereas at 45 minutes, bradycardia was seen in 6 patients (27.3%) from Group B and 2 (9.1%). At 60 minutes, 5 patients (22.7%) from Group B and 2 (9.1%) from Group A had bradycardia. At 75 minutes and 90 minutes, 6 participants (27.3%) and 4 participants (18.2%) from Group B experienced bradycardia respectively. At 75 minutes only one patient of Group A developed bradycardia. The occurrence of bradycardia was more in Group B who received a higher dose of dexmedeomidine as an adjuvant to ropivacaine in axillary nerve block. However, the difference between the two groups was not statistically significant at p<0.05. After 90 minutes no bradycardia have been observed in both the groups till 150 minutes. Before 30 minutes also, we did not observe any bradycardia in any of the groups.



Comments: The Line diagram showing the mean VAS score for postoperative pain assessment depicts that Group B participants experienced comparatively lower pain in the postoperative period than Group A. The VAS score increased mostly after 12 hours of surgery.

we can observe at 30 minutes, 90 minutes, and 120 minutes is statistically significant difference is present between the mean m-RSS scores. The Group B patients who received 2µg/kg dexmedetomidine had higher mean sedation scores than Group A at 30min, 90 min, and 120 minutes. At 150 minutes, the mean sedation score did not exhibit any statistically significant difference.

DISCUSSION

The duration of analgesia in the present study showed that the duration of analgesia was 823.64±95.98 min in Group A those who received 1µg/kg dexmedetomidine as an adjuvant, whereas Group B received 2µg/kg dexmedetomidine with 0.75% ropivacaine and showed a significant prolongation of analgesia and the duration analgesia was 926.14±86.77 min. Similar findings were observed in many studies.[2,15] Akshara et al, in their study, observed a significant difference in the duration of analgesia between the two groups. However, in their study, they used 25µg of dexmedetomidine in one group and 50µg of dexmedetomidine in another group. The Group receiving 50µg of dexmedetomidine as an adjuvant with 0.5% ropivacaine showed a mean duration of analgesia of 960±78.67 min.[15]

In the present study, the onset of sensory block following the axillary block was 9.68±1.59 min in Group A and 6.50±1.14 min in Group B. The finding was statistically significant. Akshara et al.[10] also observed a statistically significant earlier onset of sensory block with a higher dose of dexmedetomidine as an adjuvant with ropivacaine (14.60±2.42 min vs 11.47±2.21, p=0.001). Kumari et al.[2] also showed that the patients receiving 2µg/kg dexmedetomidine as an adjuvant to ropivacaine experienced significantly earlier onset of sensory block (2.29±0.75 min) than those received a dexmedetomidine dose of 1µg/kg with ropivacaine (3.88±0.68 min).

Duration of the sensory blockade, as well as a motor blockade in the current study, were prolonged in Group B than in Group A (Sensory block-Group A vs Group B: 756.14±111.43 min vs 884.09±93.49 min, p<0.001; Motor block- Group A vs Group B: 848.41±89.67 min vs 909.55±87.78 min, p=0.027). Both the findings were found to be statistically significant. The findings from the studies conducted by Kumari et al.[2] and Zhang et al.[15] are consistent with our findings. Ghazaly et al. used dexmedetomidine as an adjuvant with levobupivacine in infraclavicular brachial plexus block and while comparing they concluded that in Group $LD^{100µg}$ dexmedetomidine experienced a significant prolongation of duration of sensory block than $LD^{50µg}$ dexmedetomidine ($LD^{100µg}$ vs $LD^{µg}$: 12.8±1.2 hour vs 15.55±1.1 hour, p<0.001). Besides

the duration of the motor block was also found prolonged in the Group receiving a higher dose of dexmedetomidine as concluded by Ghazaly et al. ($LD^{100\mu g}$ vs $LD^{50\mu g}$: 11.05±1.28 hour vs 14.55±1.1 hour, $p<0.05$).[16]

In our study, we observed that both groups showed a decrease in mean arterial pressure 15 minutes after initiating the axillary block. But from the line diagram (figure 1), we can see that the decreasing trend of mean MAP was more in Group B who received a higher dose of dexmedetomidine. The incidence of hypotension (drop of MAP >20%) is significantly higher in Group B than in Group A. This has been observed from 20 minutes onwards till 105 minutes. Badugu et al.[17] found a similar trend and they found the incidence of hypotension more in the group receiving the higher dose of dexmedetomidine, though this finding was not statistically significant.

The incidence of bradycardia was higher in Group B than in Group A at 30 minutes, 45 minutes, 60 minutes, 75 minutes, and 90 minutes in our study. However, the difference was not statistically significant. The lowest heart rate was 62.55±5.56 beats/min at 75 minutes after the block. In the study conducted by Kumari et al.[2], 20.8% of patients from the group receiving 2µg/kg dexmedetomidine developed bradycardia, while 12.5% had bradycardia from the group receiving 1µg/kg of dexmedetomidine as an adjuvant.

In our study, higher dexmedetomidine produced higher sedation scores but patients in Group B also had a maximum of 3 scores on the m-RSS scale that denotes the patients can perform purposeful responses to verbal commands at the conversational level. Ghazaly et al.[16] also found similar findings in their study. Singh et al.[23] commented that they found a higher sedation score in a higher dose of dexmedetomidine with ropivacaine, though the result did not come statistically significant ($p>0.05$). No significant fall in oxygen saturation had been observed in any group in our study. No postoperative nausea and vomiting had been seen in any patients in the first 24-hour post-operative period.

CONCLUSION

In this double-blinded comparative randomized controlled trial, we found that the dose of 2µg/kg dexmedetomidine as an adjuvant to 0.75% ropivacaine showed a significant prolongation of the duration of analgesia than 1µg/kg dose. The higher dose also made the onset of sensory as well as motor block faster with additional prolongation of sensory and motor block significantly. However, a higher dose of dexmedetomidine impedes patients' safety by causing significant falls in blood pressure. Additionally, the incidence of bradycardia and increased sedation were observed in a dose of 2µg/kg of dexmedetomidine. Hypotension and bradycardia can be detrimental and can cause organ damage if not addressed timely and diligently.

Thus we conclude that even though the higher dose of dexmedetomidine improves block characteristics, 1µg/kg dose of dexmedetomidine can be considered the optimal dose as adjuvant to ropivacaine considering the minimal hemodynamic instability in peripheral nerve block.

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