Original Article

Comparison of Effectiveness between Dexamethasone and Clonidine as an Adjuvant to Bupivacaine for Ultrasound-Guided Supraclavicular Brachial Plexus Block in Patients undergoing Upper Limb Surgery

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Abstract

***Background**: The supraclavicular brachial plexus (SBPB) block is widely used for upper limb surgeries. Adding adjuvants such as dexamethasone and clonidine to bupivacaine may enhance its efficacy. This study evaluates and compares these adjuvants in terms of improved peripheral nerve blocks by reducing the onset time, improving the efficacy of the block during surgery and extending postoperative analgesia block, postoperative analgesia. **Objective**: This study was designed for the evaluation of the effectiveness of dexamethasone versus clonidine as an adjuvant to bupivacaine for ultrasound-guided supraclavicular brachial plexus block in patients undergoing upper limb surgery. **Materials and Methods**: This randomized controlled trial was conducted on 75 adult patients undergoing upper limb surgeries at Dhaka Medical College Hospital. Patients were divided into three groups: Group A (bupivacaine + normal saline), Group B (bupivacaine + dexamethasone), and Group C (bupivacaine + clonidine). Outcomes assessed included onset and duration of sensory and motor block, time for first demand of analgesia and total consumptions of analgesics within 24 hours, hemodynamic parameters, adverse effects were observed among three groups. Data were analyzed using ANOVA and t-tests, with statistical significance set at $p<0.05$. **Results**: The demographic profiles were similar in three groups (p value >0.05).The time for complete sensory block was 23.6±3.1, 18.9±3.2 and 14.7±3.0 minutes and time for the onset of maximum motor level was 29.5±3.9, 23.5±3.1 and 20.8±2.4 minutes in Group A, B and C respectively. These are significantly less in clonidine (group C) group compared to normal saline (group A) and dexamethasone (group B) group ($p<0.05$). The Ramsey sedation score (RSS) was higher in group C in first eight hours during postoperative periods than two other groups which was also statistically significant (p value <0.05). The time to regression of sensory block was 242.1±16.57, 932.9±44.9 and 739.16 ±13.47 minutes and motor block was 175.6±17.5,*

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780.8±26.2 and 570.6 ±22.0 minutes in groups A, B and C respectively. It was significantly longer in group B than in other two groups which was statistically significant (p value <0.05). Similarly in comparison to other two groups, group B had significantly increased time for motor recovery (190.8±18.3, 810.6±25.8 and 600.6±24.9 minutes in groups A, B and C respectively with p value <0.05). On the other hand, group B had significantly longer time for 1st demand of analgesic (260.6±23.0, 975.2±29.0 and 760.8±25.5 minutes in groups A, B and C respectively), significantly decreased total analgesic requirements in 24 hours (232.8±15.5, 84.7±13.8 and 166.1±19.4 mg in groups A, B and C respectively) and also significantly decreased total anti-emetic requirement in 24 hours (11.8±0.3, 4.1±0.8 and 8.0±0.0 mg in groups A, B and C respectively with p value <0.05). All over adverse effects were significantly less in group B compared to group A and group C (p value <0.05). ***Conclusion****: Dexamethasone is superior to clonidine as an adjuvant to bupivacaine in terms of prolonged analgesia and fewer side effects, making it a better choice for ultrasound-guided supraclavicular brachial plexus blocks.*

Key words*: Dexamethasone; Clonidine; Bupivacaine; Supraclavicular Brachial Plexus Block; Postoperative Analgesia*

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Introduction

Effective management of perioperative and postoperative pain is a cornerstone of modern anesthetic practice, significantly influencing surgical outcomes, patient satisfaction, and recovery time. Regional anesthesia techniques, particularly supraclavicular brachial plexus blocks (SBPBs), have gained prominence for upper limb surgeries due to their ability to provide superior analgesia, reduce opioid consumption, and minimize systemic side effects.[1] However, the relatively short duration of single-injection nerve block remains a critical limitation, necessitating strategies to extend their analgesic efficacy.[2,3]

The addition of pharmacological adjuvants to local anesthetics has emerged as an effective solution to enhance the quality and duration of nerve blocks. Among the various adjuvants studied, dexamethasone and clonidine have consistently demonstrated potential in improving analgesic outcomes.

Dexamethasone, a synthetic glucocorticoid, is believed to exert its effects through anti-inflammatory pathways and suppression of ectopic neuronal discharges, thereby prolonging the duration of both sensory and motor blocks and it does not cause any respiratory depression.[4,5]

On the other hand, clonidine, an alpha-2 adrenergic agonist, enhances local anesthetic action by hyperpolarizing neuronal membranes and inhibiting C-fiber conduction, and also offering mild sedative and anxiolytic benefits.[4]

Several studies have explored the comparative efficacy of dexamethasone and clonidine as adjuvants in SBPBs.

Yadavet al[6] conducted a double-blind study evaluating the addition of dexamethasone or clonidine to levobupivacaine for SBPB. The study reported significantly prolonged sensory and motor block durations in the dexamethasone group compared to clonidine, highlighting its superior analgesic profile and reduced postoperative analgesic requirements.

Similarly, Kishore et al[7] investigated the effects of these adjuvants with bupivacaine in SBPB and found that dexamethasone provided a markedly longer duration of analgesia and motor blockade than clonidine, with minimal adverse effects.

Rambabu et al[8] corroborated these findings, demonstrating that while both adjuvants significantly extended the duration of sensory and motor blocks, dexamethasone consistently outperformed clonidine

in terms of overall analgesic efficacy.

Despite these favorable outcomes, the selection of adjuvants in clinical practice often depends on factors such as patient-specific considerations, potential side effects, and the surgical context. Clonidine, with its faster onset and sedative properties, may be better suited for cases where immediate surgical anesthesia is prioritized.[9] While dexamethasone's prolonged motor block may be advantageous for certain procedures, it could be a limitation in settings requiring early postoperative mobilization.[10-12]

This study builds upon the existing body of evidence to further elucidate the comparative effectiveness of dexamethasone and clonidine as adjuvants to bupivacaine in SBPBs for upper limb surgeries. By evaluating key parameters such as onset times, block duration, postoperative analgesia, and adverse effects, this research aims to provide anesthesiologists with a comprehensive understanding of these adjuvants' roles, facilitating informed decision-making in clinical practice.

Materials and Methods

This prospective randomized controlled trial was conducted at Dhaka Medical College Hospital from September 2021 to August 2022. Ethical clearance was obtained from the institutional review board (ERC-DMC/ECC/2021/237), and written informed consent was obtained from all participants.

Seventy-five adult patients (ASA I and II) scheduled for elective upper limb surgeries under ultrasound-guided SBPB were included. Patients with allergies to study drugs, pre-existing neuropathies, bleeding disorders, or infections at the injection site, contralateral phrenic nerve palsy or pneumothorax, physical or mental diseases which could interfere with evaluating pain, peripheral neuropathy, history of chronic pain and pregnant women were excluded.

Participants were randomly assigned to three groups using a computer-generated randomization table.

Group A: 18 mL of 0.5% bupivacaine +
2 mL normal saline

Group B: 18 mL of 0.5% bupivacaine +
2 mL dexamethasone (10 mg)

Group C**:** 18 mL of 0.5% bupivacaine +
2 mL clonidine (100 μg)

Upon arrival in the operating room, multiparameter monitors were attached to record baseline heart rate, blood pressure, respiratory rate, and oxygen saturation. An 18-gauge IV cannula was inserted into the contralateral arm. The block was performed under aseptic conditions with patients positioned supine, their heads turned away from the surgical site, and their arms positioned medially.

The supraclavicular brachial plexus block was administered using ultrasound guidance. A 22-gauge, 1.5-inch short-beveled needle was inserted approximately 1.5 cm above the mid-clavicular point, directed laterally to the subclavian artery pulsation. The local anesthetic solution was injected incrementally, with frequent aspirations to avoid intravascular injection. The time of block administration was recorded.

Sensory blockade onset was assessed using cold spirit swabs and atraumatic pinprick testing across dermatomes. The time to dull sensation was recorded as the sensory block onset.

Motor blockade was evaluated using the Modified Bromage Scale at 10-minute intervals until the onset of block and then every 30 minutes until resolution. Motor block onset was defined as the time when the Modified Bromage Scale score reached 2. Surgery commenced once both sensory and motor blocks were achieved.

Postoperatively, patients were monitored in the Post-Anesthesia Care Unit (PACU) by a blinded anesthesiologist trained to collect study data. Vital parameters, including heart rate, blood pressure, respiratory rate, and oxygen saturation, were recorded every 15 minutes during the first hour, followed by 30-minute intervals until the surgery ended. Sedation levels were assessed using the Ramsay Sedation Scale (RSS) during intraoperative and postoperative periods at defined intervals.

Pain scores were evaluated using the VAS at 15-minute intervals for the first hour, then every 30 minutes intraoperatively, and at regular intervals postoperatively up to 24 hours. The time to first analgesic demand (VAS≥4) was recorded, and intramuscular pethidine (1−1.5mg/kg) was administered as rescue analgesia. Ondansetron (4 mg IV) was given prophylactically before administering pethidine and for managing postoperative nausea or vomiting. Total pethidine and antiemetic requirements were recorded for each group.

Adverse effects, including nausea, vomiting, shivering, dizziness, hypotension, and bradycardia, were documented throughout the perioperative and postoperative periods.

Outcome measures: The primary outcomes included onset time for sensory and motor blocks, duration of sensory and motor blocks, time to first analgesic demand. Secondary outcomes were hemodynamic changes and adverse effects (nausea, dizziness, sedation, hypotension, bradycardia).

Data analysis: Data were analyzed using SPSS version 26.0. Continuous variables were expressed as mean ± standard deviation and analyzed using ANOVA. Categorical variables were compared using chi-square tests. p value <0.05 was considered statistically significant.

Results

For this prospective randomized controlled study total 75 patients were selected and they were divided into three groups by computer generated random numbers tables—each group containing equal 25 numbers of patients. But during performing ultrasound guided SBPB two patients were diagnosed as failed block in group A. In group B one of the patients was diagnosed as failed block and group C had also a patient block failure. As per criteria they all were excluded from the study. So, finally data of 23 in group A, data of 24 patients in group B and data of 24 patients in group C were analyzed: overall data of 71 patients were analyzed.

Table I shows demographics and clinical data of study population with no significant difference among the groups. Most of the patients of all three groups (56% in group A, 48% in group B and 44% in group C) were belonging to ASA class II. But there was no statistical difference was found between the three groups as p value was >0.05. There was no significant difference in case of block failure between the groups. But group A had 8% block failure rate (Table I).

After giving SBPB the VAS score was reduced in all the three groups. But VAS score was more rapidly reduced in group B and group C at 15-min interval. This was statistically significant as p was $p<0.05$ and. Patients receiving clonidine with bupivacaine in SBPB had rapidly decreased pain immediate after block than group B and group A (Table II).

The postoperative VAS score was high in group A at 6^{th} hour, 14th hour and 20^{th} hour than two other groups. In group C VAS score was high at 12^{th} and 18^{th} hour than the other groups. But in group B VAS score was high only at 16^{th} hour in first 24 hours of postoperative periods. These were statistically significant as $p<0.05$. When data were compared between groups, VAS score decreased after giving rescue analgesia in all of the groups. So, patients receiving dexamethasone with bupivacaine in SBPB had feeling less pain during the postoperative periods as VAS score was only one time cross more than 5 and patient was needed rescue analgesia for one time only (Table III).

No statistical difference was found in case of RSS at 15 minutes after block between groups. But statistical differences were observed at 30 minutes to 120 minutes between groups. In group C RSS was higher than two other groups. It means that patients who received clonidine remained more sedated than dexamethasone and control group Table (IV).

The RSS was higher in group C in first eight hours of postoperative periods than in two others groups. It is also statistically significant as $p<0.05$. It means that patients who had received clonidine with bupivacaine for ultrasound-guided SBPB were more sedated than two others groups (Table V).

Considering the characters of the block significant results were found in case of time for complete sensory block and the onset of maximum motor level between groups ($p <0.05$). The time for complete sensory block was lowest in group C compared to group A and group B ($p <0.05$). On the other hand the time for onset of

Table I: Distribution of the subjects based on demographic and clinical status (n=75)

Characteristics		Group A (n=25)	Group B (n=25)	Group C (n=25) A vs B	p values		
					B vs C	A vs C	
Age (19-59) yrs		47.4±6.2	44.1±7.5	45.7±6.5	0.682	0.438	0.623
Height (cm)		156.3±7.4	154.8±6.4	158.4±7.8	0.740	0.670	0.560
Weight (kg)		65.2±5.1	64.8±5.7	66.1±**6.0**	0.579	0.535	0.541
Duration of surgery (min)		93.8±12.5	97.6±14.7	96.1±**12.8**	0.644	0.629	0.581
Gender	Male	16 (64%)	14 (56%)	17 (68%)	0.341	0.368	0.363
	Female	9 (36%)	11 (44%)	8 (32%)	0.438	0.415	0.463
ASA class	I	11 (44%)	13 (52%)	14 (56%)	0.389	0.425	0.486
	II	14 (56%)	12 (48%)	11 (44%)	0.485	0.445	0.499
Numbers of failed block		2 (8%)	1 (4%)	1 (4%)	0.543	0.562	0.623

Table II: Comparison of the VAS scores between groups during pre- and per-operative period (n=71)

Interval	Group A (n=23)	Group B (n=24)	Group C (n=24)	p values		
				A vs B	B vs C	C vs A
Before block	6.3±1.5	5.8±1.1	6.1±1.2	0.438	0.451	0.575
15 min	4.3±1.2	2.7±0.7	2.2±0.6	0.012[s]	0.600	0.016[s]
30 min	1.8±0.6	1.7±0.3	1.5±0.2	0.516	0.575	0.530
45 min	1.2±0.4	1.1±0.2	0.8±0.1	0.573	0.560	0.536
60 min	0.6±0.10	0.5±0.07	0.5±0.1	0.459	0.450	0.430
90 min	0.6±0.07	0.5±0.03	0.4±0.01	0.226	0.230	0.250
120 min	0.5±0.06	0.5±0.02	0.5±0.03	0.278	0.273	0.270

Values are expressed as mean±SD. Student t-test was performed to compare the mean VAS score of both groups. s= statistically significant. p value <0.05 considered as significant.

maximum motor level was also lower in group C than in group A and group B ($p < 0.05$). No significant results were found regarding the onset of sensory and motor block ($p > 0.05$) (Table VI).

Group B and C had significant results in comparison to group A regarding time to regression of sensory block (242.1±16.57 vs 932.9±44.9 vs 739.16 ±13.47 min), time to regression motor block (175.6±17.5 vs 780.8±26.2 vs 570.6 ±22.0 min) and the time for motor recovery (190.8±18.3 vs 810.6±25.8 vs 600.6 ±24.9 min). But the time was longer in group B than other two groups (Table VII).

Table III: Comparison of the VAS scores between groups during postoperative period (n=71)

Interval	Group A (n=23)	Group B (n=24)	Group C (n=24)	p values		
				A vs B	B vs C	C vs A
1st hour	1.1±0.3	0.8±0.07	1.1±0.4	0.586	0.527	0.534
2nd hour	2.2±0.8	1.1±0.2	1.4±0.5	0.270	0.490	0.155
4th hour	2.7±1.6	1.4±0.5	1.8±0.7	0.256	0.386	0.139
6th hour	5.5±1.9	1.6±0.7	2.2±0.8	0.002s	0.519	0.006s
8th hour	3.6±1.5	1.7±0.8	3.3±1.2	0.258	0.186	0.642
10th hour	3.5±1.6	1.8±0.9	3.4±1.2	0.288	0.189	0.656
12th hour	3.5±1.4	2.3±0.9	5.6±1.8	0.245	0.016s	0.030s
14th hour	5.6±2.3	3.6±1.6	3.3±1.4	0.018s	0.635	0.015s
16th hour	3.3±1.6	5.09±2.1	2.8±1.3	0.025s	0.018s	0.462
18th hour	2.7±1.2	2.8±1.2	5.1±1.9	0.518	0.014s	0.018s
20th hour	5.5±1.8	2.6±0.8	3.4±1.5	0.022s	0.371	0.025s
22nd hour	2.8±1.3	2.6±0.8	3.1±0.9	0.632	0.316	0.271
24th hour	2.6±1.4	2.5±1.2	2.9±1.8	0.755	0.828	0.686

Values are expressed as Mean±SD. Student t-test was performed to compare the mean VAS scores of both groups. s= statistically significant. p value <0.05 considered as significant.

Table IV: Comparison of the RSS scores between groups during per-operative period (n=71)

Interval	Group A (n=23)	Group B (n=24)	Group C (n=24)	p values		
				A vs B	B vs C	C vs A
15 min	1.3±0.5	0.9±0.09	1.7±0.8	0.316	0.186	0.268
30 min	1.5±0.7	1.5±0.6	3.6±1.2	0.219	0.023s	0.013s
45 min	1.8±0.6	1.5±0.4	4.3±1.5	0.217	0.018s	0.020s
60 min	1.9±0.9	1.7±0.4	3.8±0.8	0.265	0.025s	0.028s
90 min	1.6±0.7	1.8±0.7	4.2±1.3	0.238	0.018s	0.015s
120 min	1.4±0.5	1.5±0.5	3.9±0.9	0.242	0.015s	0.010s

Values are expressed as Mean±SD. Student t-test was performed to compare the mean VAS score of both groups. s= statistically significant. p value <0.05 considered as significant.

Table V: Comparison of the RSS scores between groups during postoperative period (n=71)

Interval	Group A (n=23)	Group B (n=24)	Group C (n=24)	p values		
				A vs B	B vs C	C vs A
1st hour	2.1±1.3	2.0±0.6	4.5±1.8	0.583	0.022s	0.018s
2nd hour	2.2±1.1	2.1±1.2	3.9±1.8	0.270	0.024s	0.013s
4th hour	2.1±1.3	2.2±1.2	3.8±1.1	0.566	0.017s	0.024s
6th hour	1.1±0.4	2.3±1.4	3.9±1.4	0.027s	0.031s	0.008s
8th hour	2.2±1.4	2.4±1.3	3.8±1.2	0.257	0.036s	0.034s
10th hour	2.3±1.3	2.4±1.5	3.7±1.3	0.263	0.038s	0.036s
12th hour	2.4±1.3	2.6±1.2	1.4±0.4	0.642	0.011s	0.014s
14th hour	1.4±0.5	2.9±1.1	3.2±1.5	0.016s	0.633	0.014s
16th hour	3.2±1.7	1.3±0.4	2.9±1.3	0.014s	0.026s	0.462
18th hour	2.7±1.2	2.8±1.3	1.6±0.4	0.638	0.018s	0.021s
20th hour	1.4±0.6	2.5±1.2	2.8±1.4	0.026s	0.672	0.012s
22nd hour	2.1±0.8	2.4±1.2	2.7±1.3	0.636	0.627	0.640
24th hour	2.7±1.3	2.7±1.4	2.9±1.7	0.717	0.841	0.821

Values are expressed as Mean±SD. Student t-test was performed to compare the mean VAS score of both groups. s= statistically significant. p value <0.05 considered as significant.

Table VI: Comparison of time of onset of sensory block and motor block between groups (n=71)

Characters of block (min)	Group A (n=23)	Group B (n=24)	Group C (n=24)	p values		
				A vs B	B vs C	C vs A
Onset of sensory block	4.8±2.6	3.4±2.2	2.7±1.6	0.388	0.349	0.262
Onset of motor block	5.2±2.4	4.5±2.7	3.5±1.7	0.425	0.452	0.210
Time for complete sensory block	23.6±3.1	18.9±3.2	14.7±3.0	0.038s	0.033s	0.025s
Onset of maximum motor level (Bromage score ≥2)	29.5±3.9	23.5±3.1	20.8±2.4	0.021s	0.038s	0.006s

Values are expressed as Mean±SD. The p value was analyzed by Student t-test. p value <0.05 considered as significant. s= statistically significant.

Table VII: Comparison regression time of the block between groups (n=71)

Characters	Group A (n=23)	Group B (n=24)	Group C (n=24)	p values		
				A vs B	B vs C	C vs A
Time to regression of sensory block (min)	242.1±16.6	932.9±44.9	739.16±13.5	0.001	0.001	0.001
Time to regression of motor block (min)	175.6±17.5	780.8±26.2	570.6 ±22.0	0.001	0.013	0.002
Time for motor recovery (min)	190.8±18.3	810.6±25.8	600.6 ±24.9	0.0004	0.0010	0.003

Values are expressed as Mean±SD and Student t-test was performed.p value <0.05 considered as significant.

When considering the time of first demand of analgesia (minute) between groups, it was longer in group B (975.2±29.0 min) than in group A (260.6±23.0) and group C (760.8 ±25.5 min) (p value <0.05). So, patients receiving dexamethasone with bupivacaine provided longer duration of analgesia than clonidine (Table VIII).

Total opioid requirement and total anti-emetic requirement in 1st 24 hours (mg) was higher in group A (232.8±15.5 mg & 11.8**±0.3** mg) than in group B (84.7±13.8 mg & 4.1±0.8 mg) and group C (166.1±19.4 mg & 8.0±0.0 mg) that showed the patients were receiving dexamethasone with bupivacaine in ultra-sound guided SBPB had lowest opioid and total anti-emetic requirement in 1st 24 hours. These were statistically significant as p was <0.05 (Table VIII).

Adverse effects like nausea (17.4%), dizziness (30.4%) and shivering (26.1%) were higher in group A than in group B and group C. In group C hypotension (20.8%) and bradycardia (16.7%) were more than in group A and group B. All adverse effects were less in group B than in other groups. So, the patients receiving dexamethasone with bupivacaine in ultrasound-guided SBPB had lowest complications than patients receiving clonidine. Procedure-related complications like Horner's syndrome, chest discomfort; phrenic and recurrent laryngeal nerve block, subclavian vessel puncture and pneumothorax were not observed in this study (Table IX).

Table VIII: Comparison of time of first demand of analgesia, total opioid and anti-emetic requirement between groups (n=71)

Characters	Group A (n=23)	Group B (n=24)	Group C (n=24)	p values		
				A vs B	B vs C	C vs A
Time of first demand of analgesic (min)	260.6±23.0	975.2±29.0	760.8 ±25.5	0.0006	0.010	0.001
Total opioid requirement in 1st 24 hours (mg)	232.8±15.5	84.7±13.8	166.1±19.4	0.001	0.006	0.004
Total anti-emetic requirement in 1st 24 hours (mg)	11.8±0.3	4.1±0.8	8.0±0.0	0.001	0.001	0.001

Values are expressed as mean±SD and Student t-test was performed. p value <0.05 was considered as significant.

Table IX: Comparison of per- and post-operative adverse effects between groups (n=71)

Adverse effects	Group A (n=23)	Group B (n=24)	Group C (n=24)	p values		
				A vs B	B vs C	C vs A
Nausea	4 (17.4)	1 (4.2)	3 (12.5)	0.008	0.017	0.178
Hypotension	2 (8.7)	2 (8.3)	5 (20.8)	0.346	0.0013	0.012
Bradycardia	2 (8.7)	1 (4.2)	4 (16.7)	0.173	0.014	0.018
Dizziness	7 (30.4)	2 (8.3)	3 (12.5)	0.015	0.153	0.019
Shivering	6 (26.1)	1 (4.2)	4 (16.7)	0.006	0.026	0.023
Pneumothorax	0	0	0	0	0	0
Chest discomfort	0	0	0	0	0	0
Phrenic and recurrent laryngeal nerve block	0	0	0	0	0	0
Subclavian vessel puncture	0	0	0	0	0	0
Horner's syndrome	0	0	0	0	0	0

Values within parenthesis is percentage. Chi-square test (χ^2) was performed. p value <0.05 is considered as significant.

Discussion

No significant differences were observed regarding age, gender, height, weight, or ASA status across the groups (p>0.05). In group A, two patients (8%), in group B one patient (4%) and in group C one patient (4%) had block failure without any significant difference (p >0.05).

Hemodynamic parameters like HR, SBP, DBP and MAP were stable throughout the perioperative periods and did not show any significant fluctuations (p >0.05). Hoq & Maruf[10] also observed that vital parameters like pulse rate, blood pressure, respiratory rate and arterial oxygen saturation values were similar in both the groups and did not show any significant fluctuation, which also supports our study result. These findings of our study also correlated with the study by Rustagi et al[13] who demonstrated that drop-in pulse rate and blood pressure were statistically significant in clonidine group. It was not clinically significant as none of their patients had bradycardia or hypotension nor did they have any hemodynamic instability. But it lays caution that clonidine does reduce the pulse rate and blood pressure and care should be taken for patients where decrease in pulse rate and blood pressure could be detrimental.

During pre- and postoperative period, regarding VAS score, there was no significant difference between groups except at 15 min interval. But postoperative VAS score was significantly lower in group B and group C in comparison to group A at 6th hour (p= 0.002, 0.006), at 14th hour (p = 0.018, 0.015) and 20th hour (p= 0.022, 0.025). At all other time intervals, no significant results were found. In comparison to group B, VAS score was significantly lower in group C at 12th, 16th and 18th hours (p = 0.016, 0.018 and 0.014 respectively).

Singh & Aggarwal[14] reported that the VAS score started rising in control group while remaining low in the clonidine group. Because the VAS score was significantly less from 5 to 30 min (p value at 5 min 0.043, at 10 min 0.008 and at 30 min 0.007), they concluded that onset with clonidine was faster. Again, after 240 min, the VAS was significantly lower and thus they also concluded that the action was prolonged.

The RSS was high in group C in first eight hours during postoperative periods than in two other groups which was also statistically significant that means

patients who received clonidine with bupivacaine in SBPB were more sedated than two other groups. In comparison to group A, significant results were found in group B at 6th, 14th, 16th and 20th hours ($p < 0.05$). In comparison group C except 14th, 20th, 22nd and 24th hours at all time interval significant results were found in comparison to group A ($p < 0.05$). In comparison between group B and C except 14th, 20th, 22nd and 24th hours significant results were found at all time intervals in group C ($p < 0.05$).

Rambabu et al[8] observed that clonidine induced greater sedation in the patients during the early part of their stay in postanesthesia care unit. These findings support to this study. Kishore et al[7] observed that intraoperative sedation scores were higher in the clonidine group when compared with the control group but were not statistically significant. The highest score in the clonidine group had a sedation score of 3, and no patient had a sedation score of 5 or more which required airway maintenance.

In this study, the time for the onset of sensory block and the onset of motor block was lower in group C than that in group A and group B, which was statistically insignificant as p value >0.05. Considering the time for complete sensory block which was lowest in group C (14.7±3.0 min) than that in group A (23.6±3.1 min) and group B (18.9±3.2 min) (p values were 0.038 vs 0.033 vs 0.025). The time for the onset of maximum motor level was also less in group C (20.8±2.4 min) than that of group A (29.5±3.9 min) and group B (23.5±3.1 min) which was also statistically significant.

Kishore et al[7] observed that the mean onset of sensory block was 17.50±2.86 minutes, 17.17±3.13 minutes and 18.33±3.55 minutes in dexamethasone group, clonidine group and control group respectively. The mean onset of motor block was 31.0±4.8 minutes, 30.33±4.14 minutes and 31.0±5.48 minutes in dexamethasone group, clonidine group and control group respectively, which also supports our study results. These findings of our study correlated with the study by Rambabu et al[8] who concluded that the difference in the duration of the onset of sensory blockage in both the groups was statistically not significant as p value is 0.55.

In this study the time to regression of sensory block was 242.1±16.57, 932.9±44.9 and 739.16 ±13.47 minutes in groups A, B and C respectively and time to regression of motor block 175.6±17.5, 780.8±26.2 and 570.6 ±22.0 minutes in groups A, B and C respectively. It was longer in group B than in group A and group C. The time for motor recovery was prolonged in case of group B (810.6±25.8 minutes) than in two other groups (190.8±18.3 and 600.6 ±24.9 minutes in groups A and C).

Shah et al[15] concluded that the duration of sensory and motor block was significantly more in dexamethasone group compared with clonidine group *(P_1 sensory = 0.047, P_1 motor = 0.031).*

In this study, when considering the time of first demand of analgesia (minute) in three groups, it was longer in group B (975.2±29.0 min) than in group A (260.6±23.0) and in group C (760.8 ±25.5 min).

Another study found the time to first analgesic requirement was significantly more in clonidine group and dexamethasone group compared with control group (P_1= 0.006, P_2= 0.016).[15] These findings also correlate this study.

Kishore et al[7] had observed that the mean duration of analgesia was 11.49±1.66 hours, 19.41±2.60 hours and 7.56±1.65 hours in clonidine group, dexamethasone group, and control group respectively.

In this study, total opioid requirement in 1st 24 hours was more in group A (232.8±15.5 mg) than in group B (84.7±13.8 mg) and group C (166.1±19.4 mg). It showed the patients receiving dexamethasone with bupivacaine in SBPB had lowest opioid requirement in 1st 24 hours.

Tandoc et al[16] evaluated 90 patients undergoing shoulder surgery using interscalene block with 0.5% bupivacaine (40 mL) and divided them into 3 groups: control patients with no additive, and two dexamethasone groups to whom 4 mg and 8 mg dexamethasone were added. The duration of analgesia was significantly prolonged in both dexamethasone groups (21.6 hours and 25.2 hours respectively) compared with the control group (13.3 hours). Postoperative analgesic consumption for the first 48

hours was significantly lower in both dexamethasone groups compared to the control group.

Singh & Aggarwal[14] suggests that clonidine 0.150 mg in 40 mL of 0.25% bupivacaine significantly enhances the quality of supraclavicular brachial plexus block in upper limb surgeries by a faster onset and prolonged duration of sensory and motor block, enhancing post-operative analgesia and decreased post-operative opioid requirement in first 24 hours.

In this study total antiemetic requirement in 1st 24 hours was significantly lower in group B and group C in comparison to control group A ($p<0.05$). Adverse effects like nausea (17.4%), dizziness (30.4%) and shivering (26.1%) were higher in group A than in group B and group C. In group C hypotension (20.8%) and bradycardia (16.7%) were more than in group A and group B. All over perioperative adverse effects were less in group B than any other group which was statistically significant ($p <0.05$).

Kishore et al[7] had observed that in two patients who received clonidine the heart rate dropped below 50 beats per minute and they were given inj. atropine 0.6 mg intravenously. There were no such episodes later in these patients. No complications were noted in the dexamethasone and saline groups in the perioperative period.

There was no incidence of complications such as Horner's syndrome, chest discomfort, phrenic and recurrent laryngeal nerve block, subclavian vessel puncture and pneumothorax in all groups in our study. These findings also correlate with Alfred et al[17] who reported no vascular punctures, nerve injury, pneumothorax, and local anesthetic toxicity in any of the groups.

In conclusion, dexamethasone is a more effective and safer adjuvant to bupivacaine than clonidine for supraclavicular brachial plexus blocks, providing prolonged analgesia and improved patient outcomes.

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