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EVALUATION OF THE EFFECT OF ORAL CLONIDINE IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK WITH BUPIVACAINE AND DEXAMETHASONE

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ABSTRACT

Background: Brachial plexus block is gaining popularity day by day over general anaesthesia for upper extremity surgeries. However, the quality of anaesthesia and analgesia depends on using adjuvant to local anaesthetics. It is previously reported that clonidine used as an adjuvant to bupivacaine increases duration of analgesia. As a premedication clonidine has some benefits such as sedation, analgesia and anxiolysis in regional anaesthesia practice. **Objectives:** The present study was conducted to evaluate the effects of oral clonidine premedication upon the quality of anaesthesia and analgesia, haemodynamic status and adverse effects in supraclavicular brachial plexus block with bupivacaine and dexamethasone in patients undergoing upper limb surgeries. **Methods:** A total number of 60 patients of American Society of Anaesthesiologists physical status class I and II were randomized double blindly into two groups of 30 patients in each. Group-C(case group) received tablet Clonidine (100mcg) and Group-B(control group) received tablet Vitamin B complex as a placebo,45 minutes before the block procedure with sips of water. Both Group C and Group B patients was blocked with 15 ml of 0.5% bupivacaine + 1 ml dexamethsone + 4 ml distilled water under ultrasound guidance. All observations (haemodynamic variables, oxygen saturation, level of sedation, onset and duration of sensory and motor block, duration of analgesia, post-operative pain score in VAS, first analgesic demand, side effects) were also assessed and recorded. Datas were collected in preformed data collection sheet and analyzed by the statistical packages for social science (SPSS) software (version 23.0). **Results:** In this study, onset of sensory block was found 7.6±0.8 minute in group C and 13.0±1.4 minute in group B. The difference was statistically significant ($p<0.05$) between two groups. The onset of motor block was found 18.3±1.1 minute in group C and 18.7±1.8 minute in group B,which wsa not statistically significant ($p=0.3031$). Duration of sensory block was found 652.9±35.6 minute in group C and 454.2±30.8 minute in group B. Duration of motor block was found 574.5±34.3 minute in group C and 366.1±51.2 minute in group B. The differences were statistically significant ($p<0.05$) between two groups. Duration of analgesia was found 731.8±41.8 minute in group C and 528.8±47.7 minute in group B. The difference was statistically significant ($p<0.05$) between two groups. After 9 hours, mean VAS score was found 0.03±0.21 in group C and 3.6±1.3 in group B, after 13 hour, mean VAS score was found 3.6±1.38 in group C. The difference was statistically significant ($p<0.05$) between two groups. After 90 minutes, mean Ramsay sedation score was found 2.73±0.44 in group C and 1.17±0.46 in group B. After 105 minutes, mean Ramsay sedation score was found 2.93±0.25 in group C and 1.13±0.34 in group B, which were statistically significant ($p<0.05$) between two groups. Mean arterial pressure- after 5 min, after 10 min, after 15 min, after 30 min, after 45 min, after 1 hour, after 2 hour, after 3 hour and after 4 hour were significantly ($p<0.05$) higher in group B than group C. 13 (43.3%) patients had dry mouth in group C and 2(6.7%) in group B, which was significant ($p<0.05$) but other complains were not significant ($p>0.05$) between two groups. 2 (6.7%) patients in group C and 29 (96.7%) patients in group B were found one time requirement of rescue analgesic within 12 hours of postoperative period according to VAS. The difference was significant ($p<0.05$) between two groups. **Conclusion**: Addition of clonidine as premedication in supraclavicular brachial plexus block with bupivacaine and dexamethasone ensures better quality of block, better quality of anaesthesia by reducing complications and longer duration of post-operative analgesia with moderate sedation.

KEYWORDS: Bupivacaine, dexamethasone, anaesthesia, analgesia.

INTRODUCTION

The brachial plexus is defined as that network of nerves supplying the upper extremity and formed by the union of the ventral primary rami of cervical nerves 5 through 8 (C5-C8), including a greater part of the first thoracic nerve (T1) (Neal et al. 2002).[1] For upper limb surgeries brachial plexus blockade is the cornerstone of the peripheral nerve regional anesthesia practice of most anaesthesiologists (Neal et al. 2009).[2] Brachial plexus blocks are commonly achieved through interscalene, supraclavicular, infraclavicular, or axillary approach. The supraclavicular level is an ideal site to achieve anaesthesia of the entire upper extremity just distal to the shoulder as the plexus remains relatively tightly packed at this level, resulting in a rapid and high-quality block.[3]

Ultrasound has revolutionized regional anaesthesia in practice and the proper drug can be placed at the right place by an experienced anaesthesiologist and the block will help in avoiding all the complications.[4]

Ultrasound guidance for supraclavicular brachial plexus block is clinically useful for accurate nerve localization and to minimize the number of needles attempts as well as real time visualization of the needle and spread of drugs.

Dexamethasone is a long-acting glucocorticoid with potent anti-inflammatory and analgesic effect. It also helps by attenuating the release of inflammatory mediators, reducing ectopic neuronal discharge and inhibiting potassium channel-mediated discharge of nociceptive C-fibres (Shawki, 2018).[5] Addition of dexamethasone as an adjuvant to local anaesthetics effectively and significantly prolongs the duration of analgesia as well as producing earlier onset of action in adults.[6,7]

Bupivacaine is the most commonly administered drug in brachial plexus blocks, introduced by Ecknstam in 1957 and used clinically by Telivuo in 1963. However, onset of action and duration of anaesthesia are the limiting factors. To minimize these drawbacks, many drugs including clonidine (Chakraborty et al. 2010), verapamil (Lalla et al. 2010), tramadol, morphine (Ghadirian et al. 2016), fentanyl (Zainab et al. 2015) and dexamethasone have been co-administered with local anaesthetic to achieve quicker onset, improve the analgesic intensity and prolong the duration of action. [8,9,10,11]

Clonidine stimulates α2 adrenergic–inhibitory neurons in vasomotors center, resulting in reduce central sympathetic outflow to the peripheral tissues and causes peripheral vasodilatation, resulting in decreased systolic blood pressure, heart rate and cardiac output.[12]

This study was designed to evaluate the effects of clonidine when used as a premedication to bupivacaine and dexamethasone in supraclavicular brachial plexus block, in terms of efficacy in onset, duration, potency of sensory and motor block, sedation score, analgesia and side effects.

OBJECTIVES

General objective

Evaluate the effects of clonidine as a premedication in supraclavicular brachial plexus block with bupivacaine and dexamethasone in patients undergoing upper limb surgeries.

Specific objectives

1. To measure onset time of sensory and motor block.
2. To measure duration of sensory and motor block.
3. To measure duration of analgesia according to VAS score.
4. To compare the haemodynamic parameters (heart rate, blood pressure and oxygen saturation) in between two groups.

METHODOLOGY

Type of study	**Prospective, randomized double-blinded placebo controlled study.**
Place of study	Department of Anaesthesia, Analgesia, Palliative & Intensive Care Medicine, Dhaka Medical College Hospital, Dhaka.
Study period	October 2018 to June 2019
Study population	Patients with ASA grade I & II was selected after getting admission into hospital for the upper limb surgery, after careful history taking, thorough general and systemic examination and appropriate investigations fulfilling inclusion and exclusion criteria.
Sampling technique	Simple random sampling

Criteria for selection

Inclusion criteria

1. Patients undergoing upper limb surgery at the level of elbow, forearm and hand with ASA physical status I, II.
2. Age between 18 to 60 years of both genders.
3. Informed consent for inclusion in the study
4. Weight between 40 to 70 kg.

Exclusion criteria

1. Patient with severe renal, respiratory, hepatic or cardiac disease
2. Chronic diseases i.e. psychological or neurological or neuromuscular disorder
3. Drug abuser i.e. alcohol or any other illicit drugs
4. Patients who have allergy to local anesthetics
5. Any coagulation disorder

6. Inability to perform the pinprick test because of a dressing or cast
7. Morbidly obese patient
8. H/O HTN, DM, systemic infection, neuropathy, and brachial plexus injury
9. Pregnancy
10. Contralateral phrenic nerve injury.

Sample size: The targeted sample was 96.04. Due to short duration of study, 60 samples were taken in this study.

Study Procedure

The study protocol was approved by the ethical review board of Dhaka Medical College Hospital. A total of 60 patients fulfilling the inclusion and exclusion criteria were selected for the study who were going for upper limb surgery distal to the mid-arm (elbow, forearm and hand) in the Dhaka Medical College Hospital. Selected patients were enrolled with unique ID. Subjects were briefed about the objectives of the study, risk and benefits, freedom for participating in the study and confidentiality. Then informed written consent was taken. The patients were divided into two groups by random sampling method and were fixed with 30 patients in each group. In Group-C patients were received 100(mcg) Tab. clonidine, while in Group-B patients were received Tab. Vitamin B-complex as placebo orally with sips of water 45 minutes before supraclavicular brachial block. All patients of both groups were blocked with 15 ml of 0.5% bupivacaine + 1 ml dexamethsone + 4 ml distilled water under ultrasound guidance.

Statistical analysis

Statistical analyses were carried out by using the Statistical Package for Social Sciences version 23.0 for Windows (SPSS Inc., Chicago, Illinois, USA). The mean values were calculated for continuous variables. The quantitative observations were indicated by frequencies and percentages. Chi-Square test with Yates correction was used to analyze the categorical variables, shown with cross tabulation. Student t-test was used for continuous variables. P values <0.05 was considered as statistically significant.

RESULT

Table I: Distribution of the study patients by age (N=60)

Age (years)	Group C (n=30)		Group B (n=30)		P value
	n	%	n	%	
≤20	6	20.0	5	16.7	
21-30	8	26.7	7	23.3	
31-40	7	23.3	7	23.3	
41-50	5	16.7	3	10.0	
>50	4	13.3	8	26.7	
Mean±SD	34.8	±13.2	38.1	±15.0	0.374^{ns}
Range (min-max)	18	-60	18	-60	

Ns= not significant.

P value reached from unpaired t-test.

Group C= Tablet Clonidine 100 mcg.

Group B= Placebo drug.

Table I shows that 8(26.7%) patients were belonged to age 21-30 years in group C and 7(23.3%) patients in group B. The mean age was found 34.8±13.2 years in group C and 38.1±15.0 years in group B. The difference was not statistically significant (p>0.05) between two groups.

Table II: Distribution of the study patients according to gender (N=60)

Gender	Group C (n=30)		Group B (n=30)		P value
	n	%	n	%	
Male	17	56.7	16	53.3	0.795^{ns}
Female	13	43.3	14	46.7	

Ns= not significant.

P value reached from chi square test.

Table II shows that 17 (56.7%) patients were male in group C and 16(53.3%) in group B. The difference was not statistically significant (p>0.05) between two groups.

Table III: Distribution of the study patients according to ASA class (N=60)

ASA class	Group C (n=30)		Group B (n=30)		P value
	n	%	n	%	
I	23	76.7	25	83.3	0.519^{ns}
II	7	23.3	5	16.7	

Ns= not significant.
P value reached from chi square test.
ASA=American Society of Anaesthesiologist.

Table III shows that 23 (76.7%) patients were found ASA class I in group C and 25(83.3%) in group B. The difference was not statistically significant (p>0.05) between two groups.

Table IV: Distribution of the study patients according to duration of sensory and motor block (N=60)

	Group C (n=30)		Group B (n=30)		P value
	Mean	±SD	Mean	±SD	
Duration of sensory block (min)	652.9	±35.6	454.2	±30.8	0.001^{s}
Range (min-max)	590	-710	390	-496	
Duration of motor block (min)	574.5	±34.3	366.1	±51.2	0.001^{s}
Range (min-max)	510	-640	248	-540	

S= significant.
P value reached from unpaired t-test.

Table IV shows that mean duration of sensory block was found 652.9±35.6 minute in group C and 454.2±30.8 minute in group B. The mean duration of motor block was found 574.5±34.3 minute in group C and 366.1±51.2 minute in group B. The differences were statistically significant (p<0.05) between two groups.

Table V: Distribution of the study patients according to duration of analgesia. (N=60)

	Group C (n=30)		Group B (n=30)		P value
	Mean	±SD	Mean	±SD	
Duration of analgesia (min)	731.8	±41.8	528.8	±47.7	0.001^{s}
Range (min-max)	660	-810	453	-640	

S= significant.
P value reached from unpaired t-test.

Table V shows that mean duration of analgesia was found 731.8±41.8 minute in group C and 528.8±47.7 minute in group B. The difference was statistically significant (p<0.05) between two groups.

Figure 1 shows after 60 minute, mean Ramsay sedation score was found 1.90±0.61 in group C and 1.27±0.49 in group B. After 75 minute, mean Ramsay sedation score was found 2.30±0.59 in group C and 1.20±0.48 in group B.

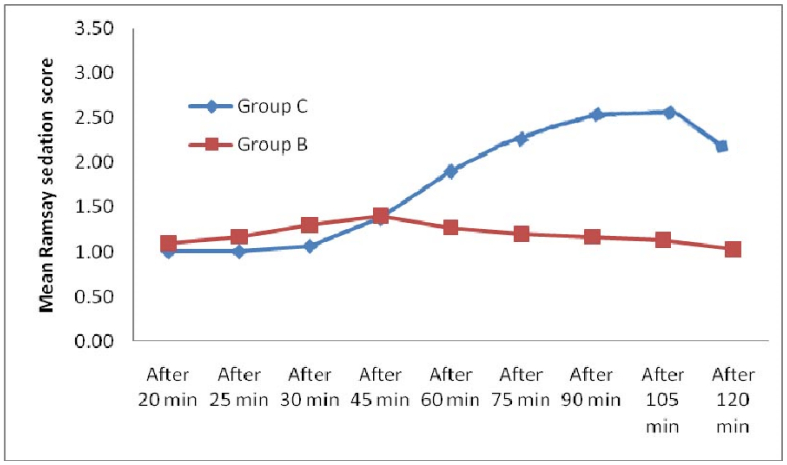

Figure 1: Line diagram shows Ramsay sedation score in different follow up.

Figure 2 shows mean pulse rate- after 0 min, after 5 min, after 10 min, after 15 min, after 30 min, after 45 min, after 60 min, after 120 min and after 180 min were significantly (p<0.05) higher in group B than group C.

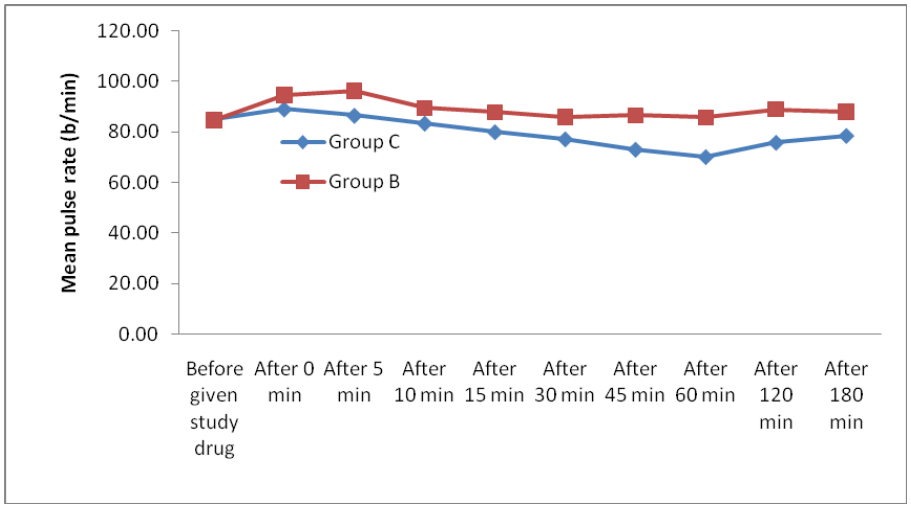

Figure 2: Line diagram shows pulse rate in different follow up.

DISCUSSION

In this study observed that mean onset of sensory block was found 7.6±0.8 minute in group C and 13.0±1.4 minute in group B, which was statistically significant (p<0.05) between two groups. The mean onset of motor block was found 18.3±1.1 minute in group C and 18.7±1.8 minute in group B, which was not statistically significant (p=0.3031). In this study the mean duration of sensory block was found 652.9±35.6 minute in group C and 454.2±30.8 minute in group B. The mean duration of motor block was found 574.5±34.3 minute in group C and 366.1±51.2 minute in group B. The difference were statistically significant (p<0.05) between two groups. Singh and Aggarwa (2010) and Iohom et al. (2005), where they observed statistically significant difference in onset time of sensory blockade with Clonidine group having early onset.[13,14] Gupta et al. (2017) reported onset of sensory blockade and duration of motor blockade were not statistically significant (p>0.05) between two groups.[16] Jayaram et al. (2014) reported that oral clonodine premedication in patients with spinal anaesthesia hastens the onset of sensory block and extends the duration of both sensory and motor block, but no effect in case of motor blockade onset, which was similar to this study results.[17] Ahmed et al. (2011) reported that addition of parenteral clonidine with bupivacaine in brachial plexus block resulted early onset of sensory block and also prolonged the duration of sensory and motor block but onset of motor block was not significant, which was also close to the results of this study.[18]

In present study showed that mean duration of analgesia was found 731.8±41.8 min in group C and 528.8±47.7 min in group B. The difference was statistically significant (p<0.05) between two groups. Gupta et al. (2017) the mean duration of sensory analgesia was 268.27±12.18 min in patients of Group C and 223.15 ±14.31 min with in patients of Group T with statistically significant difference (p=0.000). In Eledjam et al. (1991) the duration of analgesia was 994.2±34.2 min in Clonidine group and 728.3±35.8 min in control group with p<0.001. There were some variations in the duration times in compare to the other studies because in this study clonidine was used as a premedication.[19]

In current study observed after 9 hour, mean VAS score was found 0.03±0.21 in group C and 3.6±1.3 in group B, which was statistically significant and analgesic drug was given in group B patients for the first time. After 12 hour, mean VAS score was found 3.6±1.38 in group C and analgesic drug was given in this group of patients for the first time. The difference was statistically significant (p<0.05) between two groups.

In this study after 75 minute, mean Ramsay sedation score was found 2.30±0.59 in group C and 1.20±0.48 in group B. After 90 minute, mean Ramsay sedation score was found 2.73±0.44 in group C and 1.17±0.46 in group B, which were statistically significant (p<0.05) between two groups. Jayaram et al. (2014) reported that at 90th minute 25 patients in clonidine group were sedated with a maximum percentage of patients belonging to count 3 sedation score of Ramsay scale (83.22%).[17]

In this study reported the mean pulse rate- after 5 min, after 10 min, after 15 min, after 30 min, after 45 min, after 60 min, after 120 min and after 180 min were significantly (p<0.05) lower in group C than group B. Kotwani et al. (2017) reported the mean heart rate was 75.33±12.366 beats/min in group C and 78.00±8.300 beats/min in group CL group. The difference was not statistically significant (p>0.05) between two groups.[20]

In this study observed that the mean systolic blood pressure- after 30 min, after 45 min, after 1 hour, after 2

hour, after 3 hour and after 4 hour were significantly ($p<0.05$) higher in group B than group C. Comparison the other studies Kotwani et al. (2017) the mean SBP was 121.20±13.000 mmHg in group C and 121.0±11.847 mmHg in group CL group. The difference was not statistically significant ($p>0.05$) between two groups.[20] Patient's sedation score was assessed by Ramsay sedation score at every 5 min during the surgery till it reached maximum level. In post operative period, it was assessed every 15 min till the patient becomes fully awake.

In this study observed that the mean oxygen saturation - before given study drug, after 0 min, after 5 min, after 10 min, after 15 min, after 30 min, after 45 min, after 60 min, after 120 min and after 180 min were not significant ($p>0.05$) between two groups. Kotwani et al. (2017) reported that the mean $Sp0_2$ was 99.10±0.403% in group C and 99.30±0.466% in group CL group. The difference was not statistically significant ($p>0.05$) between two groups, which was similar to the results of this study.

CONCLUSIONS

Preoperative use of oral clonidine in supraclavicular brachial plexus block with bupivacaine and dexamethasone under ultrasound guidance provides rapid onset of sensory block but has no effect on the onset of motor block. It also extends the duration of sensory and motor blockade. In addition it prolongs the duration of analgesia with moderate sedation and less adverse effects. That means oral clonidine improves the quality of anaesthesia and analgesia when it was used as a premedication.

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