MEDICO RESEARCH CHRONICLES
ISSN NO. 2394-3971
DOI No. 10.26838/MEDRECH.2021.8.6.565
Contents available at www.medrech.com

MAGNESIUM SULFATE VERSUS FENTANYL AS AN ADJUVANT WITH BUPIVACAINE IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK- A COMPARATIVE STUDY

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ARTICLE INFO

Article History
Received: October 2021
Accepted: November 2021
Key words: Block, Group, Brochial Plexus block, Bupivacaine, Study, Magnesium

ABSTRACT

ORIGINAL RESEARCH ARTICLE

Background: Brachial plexus block is an excellent method for attaining optimal operating conditions for upper limb surgeries. This method produces complete muscular relaxation, maintaining haemodynamic stability. **Objectives:** The objective of the study was to evaluate the effectiveness of magnesium sulfate and fentanyl as an adjuvant to bupivacaine in supraclavicular brachial plexus block. **Methods:** This observational study was conducted in the Department of Anaesthesiology and ICU, Bangladesh Medical College Hospital over a period of six months after acceptance of protocol. Study populations were patients of ASA Status I–II planned for upper limb orthopedic surgical procedures under supraclavicular brachial plexus block. Study populations were randomly allocated into one of the two groups, 30 in each- group A & B. Group A - Patients received 38 ml of 0.25% bupivacaine with 100 µg (2ml) of fentanyl to make a total volume of 40 ml. Group B - Patients given 38 ml of 0.25% bupivacaine with 80mg (2ml, 4%) magnesium sulfate. Parameters observed were demographic, hemodynamics, onset, and duration of sensory and motor block,

analgesia. By using SPSS, version 22.0 data were analyzed. A Chi-square test was applied for qualitative data and an Unpaired t-test was applied for quantitative data. the p-value of <0.05 was considered as statistically significant. **Results:** In this study, there was no significant difference between groups in respect of demographic (age, gender) and ASA status (p>0.05). Regarding hemodynamics (heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure) were no statistically significant differences between Group A and Group B (p>0.05). The onset of sensory (p=0.825) and motor block (p=0.968) was not statistically significant between the two groups. Duration of sensory and motor block was significantly increased in Group A compared to Group B (p=0.001). Duration of analgesia was no significant difference between the two groups (p=0.127). No significant difference in the total number of rescue analgesics between Group A and Group B (p=0.640). From this study, it is found that magnesium sulphate, as well as fentanyl as an adjuvant to bupivacaine, prolongs the duration of sensory and motor block in supraclavicular brachial plexus block. **Conclusion:** Magnesium sulphate, as well as fentanyl as an adjuvant to bupivacaine, prolongs supraclavicular brachial plexus block.

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2021, www.medrech.com

INTRODUCTION

For perioperative pain management, peripheral nerve blocks are gaining widespread popularity because of their specific advantages over general anesthesia and central neuraxial anesthesia. One should be familiar with the clinical pharmacology of the local anesthetic drugs and adjuvants, to select an appropriate local anesthetic drug for a specific clinical situation. By inhibiting the excitatory process in the nerve endings or in the nerve fibers, local anesthesia exerts its effect. The sequence of events is generally accepted as the mechanism of action of local anesthetic agents are binding of the local anesthetic moiety to the receptor sites in the nerve membrane, reduction in sodium permeability, decrease in the rate of depolarization, failure to achieve threshold potential, lack of development of propagated action potential and conduction blockade. Brachial plexus blockade now-a-day is the cornerstone of the peripheral nerve regional anesthesia practice of most anesthesiologists.[1] Brachial plexus block is controlled by various approaches viz. supraclavicular, interscalenous, infraclavicular and axillary routes.[2] The supraclaviculart level is an ideal site to achieve anesthesia 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. The supraclavicular block is often called the ‘‘spinal of the arm for this reason.’’[3] With local anesthetics for perioperative analgesia leads to stable hemodynamics intraoperatively, smoother emergence from general anesthesia, sensory blockade of the brachial plexus. And it decreased the need for supplemental analgesics or suppositories in the Post-operative period., A brachial plexus block at the level of the clavicle can anesthetize all four distal upper extremity nerve territories without a requirement for a separate block of the musculocutaneous nerve compared to the axillary approach.4 The first brachial plexus block was performed in 1885 with cocaine by Halstead. In 1911, Hirschell described the first percutaneous technique for performing the block.[5] To local anesthetic solutions in an

attempt to increase its efficacy and duration in recent years, it has gained popularity with the addition of various adjuncts. Systemic adverse effects and prolonged motor block are avoided along with a reduction in the total dose of local anesthetic used. With a local anesthetic solution, adjuncts like epinephrine, bicarbonate, opioids, clonidine, neostigmine, and tramadol have been injected concomitantly. Time of onset of anesthesia, duration, and quality of regional blocks, etc. are prime factors for good anesthesia. Each drug has advantages and disadvantages, so efforts were made to combine the adjuvant with local anesthetics to improve patient and surgeon satisfaction. To motor neural block, bupivacaine is frequently used as the local anesthetic for brachial plexus anesthesia because it offers the advantage of providing a long duration of action and a favorable ratio of sensory. In order to provide a better quality of anesthesia intraoperatively and prolong the duration of postoperative analgesia, various adjuvants are added to local anesthetic solutions.[1] Many adjuvant drugs including Dexmedetomidine, clonidine, morphine, verapamil, midazolam, tramadol, fentanyl, alfentanil, sufentanil, and Dexamethasone have been co-administered with bupivacaine to achieve quicker onset, improve the analgesic intensity and prolong the duration of action. Magnesium sulphate and fentanyl are two such adjuvant drugs that can be used in combination with bupivacaine to enhance the analgesic efficacy of the drugs and that facilitate early achievement and prolongation of the block.[5] Fentanyl being highly lipid-soluble diffuses into the spinal cord and binds to dorsal horn receptors rapidly. This produces rapid onset of analgesia with minimal cephalic spread. A previous study reported Fentanyl added to bupivacaine most efficacious regimen for brachial plexus block among patients undergoing upper limb orthopedic surgeries.[6] Magnesium is the fourth most common cation in the body, has postsynaptic N-methyl D-aspartate calcium channel blocker properties. It has been used successfully to potentiate opioid analgesia to treat neuropathic pain in animals. A previous clinical study demonstrated that adding magnesium sulfate to supraclavicular brachial plexus block may increase the sensory and motor block duration and time to first analgesic use, and decrease total analgesic needs, with no side effects.[7]

OBJECTIVE

General Objective:

- To evaluate the effectiveness of Magnesium Sulfate and fentanyl as an adjuvant with bupivacaine in supraclavicular brachial plexus block.

Specific Objectives:

- To assess and compare the onset and duration of sensory and motor block in between Group A (receiving Fentanyl and Bupivacaine) and Group B (receiving Magnesium sulfate and Bupivacaine).
- To assess and compare the duration of analgesia by VAS score in between Group A and Group B.
- To compare, hemodynamics (HR, SBP, DBP, MAP) in between Group A and Group B.

METHODOLOGY AND MATERIALS

This was a prospective observational study. The study was conducted in the Department of Anaesthesiology and ICU, Bangladesh Medical College Hospital, Dhaka from 17th January 2020 to 16th July 2020. Ethical approval was taken from the Ethical Review Board, Bangladesh Medical College Hospital. A total of 60 patients, ASA physical status I, II who have undergone upper limb orthopedics procedures under supraclavicular brachial plexus block were included in the study. Informed consent was obtained from all the patients enrolled in the study and asked to remain too fast 6 hr. before surgery selected after their admission in Bangladesh Medical College Hospital after fulfilling inclusion and exclusion criteria. A total of 60 participants

both male and female were recruited in this study as the study population. Patients with severe comorbidities, obesity (body mass index >35). Infections at the site of the block were excluded from the study. Depending upon the study drug administered, the patients were randomly divided into 2 groups. In Group-A, patients were given bupivacaine (0.25%) 38ml and fentanyl 100 µg (2ml), total of 40ml. In Group-B, patients were given bupivacaine (0.25%) 38ml and Magnesium Sulfate 80 mg (2ml, 4%). On the day of surgery, all patients were taken to the operation theater. Intravenous line secured with the 18-gauge cannula. The patient was positioned supine with the head turned about 30° to the contralateral side. The interscalene groove palpated at its most inferior point and the latter can be felt in a plane just medial to the midpoint of the clavicle which is just posterior to the subclavian artery pulse. After a skin wheal with a local anesthetic at a very flat angle against the skin, a 22-gauge, 1.5-inch needle was directed just above and posterior to the subclavian pulse and directed caudally. The needle was advanced until paresthesia encountered or muscle contraction of the forearm is noted. If contraction was still observed, then a local anesthetic was injected. The needle insertion path was reevaluated, if the rib was encountered without paresthesia or if blood was encountered, the needle withdrawn, and the landmarks as well as the plane. The hemodynamic parameters were evaluated before administration of sample drug and after administration every 5 min for 20 min and thereafter every 30 min for 180 min. The onset of sensory and motor block was assessed at 5 min intervals up to 30 min. The blockage was considered a failure when sensory anesthesia was not achieved within 30 min. General anesthesia is then given subsequently to these patients and excluded from the study. The duration of sensory blockade, defined as the time between the onset of sensory block and return of dull pain but VAS<3. The duration of the motor block was assessed every 10 minutes till the ability of the patient to first move the fingers. Analgesia was assessed using a 10-point visual analog scale, in which a score of "0" shall indicate "no pain" and a score of "10" "worst pain imaginable." Analgesia using VAS score, at regular interval of 15 min for first one hour, 30 minutes for the second hour, once every 2 hours until the 8 hours and once every 4 hours for the next 12 hours in all two groups. Rescue analgesia in the form of injection pethidine (1.5 mg/kg) intramuscularly was given when VAS >3 in all two groups. Parametric data were reported as mean ±SD. A Chi-square test was applied for qualitative data and an Unpaired t-test was applied for quantitative data. a p-value of <0.05 was considered as statistically significant Data processing work consist of registration schedules, editing computerization, preparation of dummy table, analyzing and matching of data by SPSS version 22.0.

RESULT

Table- 1: Distribution of the patients according to age (N=60)

Age (years)	Number of patients			p-Value
	Group A (n=30)	Group B (n=30)	Total & Percentage (N=60)	
18-39	21(70.0)	18(60.0)	39(65.0)	
40-60	9(30.0)	12(40.0)	21(35.0)	
Mean ±SD	34.7±8.53	35.21±9.42		0..826^{ns}

Table 1 showed age distribution of patients. According to the questionnaire, history of all the 60 selected cases were taken, while studying the distribution of cases by age

it was found that majority of the patients i.e. 65.0% (n=39) were between 18-39 years, 35.0% (n=21) were between 40-60 years. Mean age was found to 34.7±8.53 years. No significant differences were found between groups with respect to age.

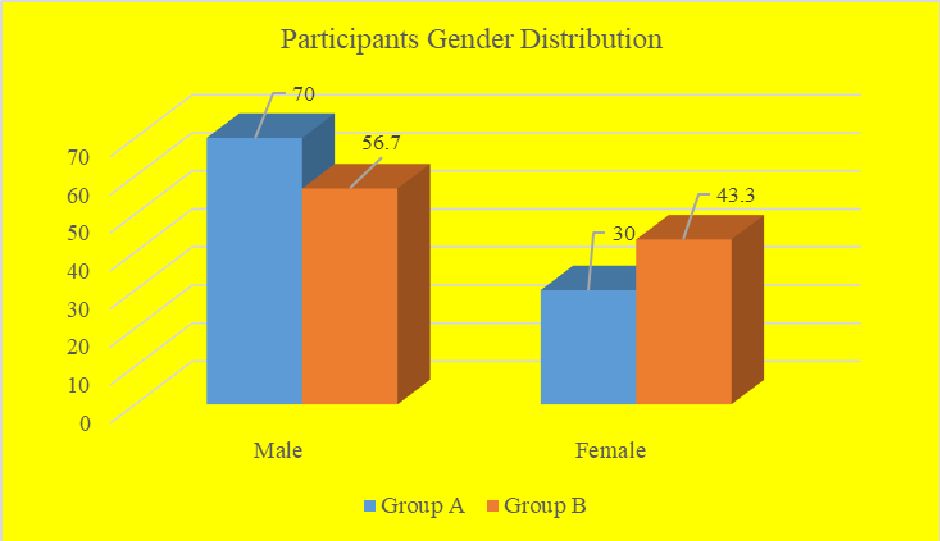

Figure I: Gender Distribution of the Participants (N=60)

Table-2: Distribution of patients according to American Society of Anesthesiologist (ASA) (N=60)

Status	Number of Patient		p-Value
	Group A (n=30)	Group B (n=30)	
ASA I	19(63.3)	18(60.0)	0.790^{ns}
ASA II	11(36.7)	12(40.0)	

Table 2 showed the American Society of Anesthesiologist (ASA) physical status. There was no significant difference between the groups (p=0.790). Comparison was done by Chi-Square (χ^2) test. All 60 enrolled patients were randomized to groups, 30 patients of each. All patients were with ASA physical status I and II. Group A, 19(63.3) were ASA I and 11(36.7) were ASA II. Group B, 18(60.0) were ASA I and 12(40.0) were ASA II.

Table- 3: Distribution of patients according to indications of surgery (N=60)

Indications of surgery	**Frequency (n)**	**Percentage (%)**
Supracondyalr fracture	21	35.0
Fracture radius ulna	27	45.0
Olecranon fracture	8	13.3
Fracture neck of humerus	4	6.7

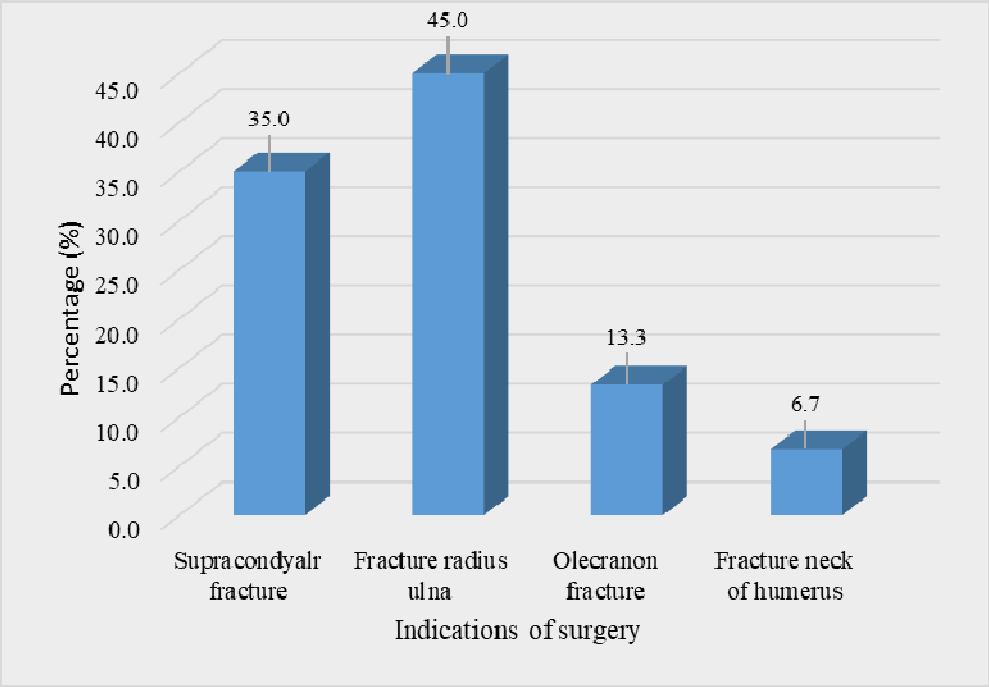

Figure II: Participants Types of Surgery Procedures Distribution (N=60)

Figure II: Bar diagram showed the distribution of patients according to indications of surgery. Indication for surgery was supracondylar fracture (35.0%), fracture radius-ulna (45.0%), olecranon fracture (13.3%), and fracture neck of humerus (6.7%).

Table- 4: Distribution of patients according to time of onset of sensory block (N=60)

Time (min)	Number of Patient		p-Value
	Group A (n=30)	Group B (n=30)	
≤5	2(6.7)	0(0.0)	0.150^{ns}
6-10	23(76.6)	19(63.3)	0.259^{ns}
>10	5(16.7)	11(36.7)	0.079^{ns}
Mean ±SD	8.17±1.4 min	9.12±1.68 min	0.825^{ns}

Table 4 showed time to onset of sensory block. Onset of sensory block was faster in Group A (8.17±1.4 min) than Group B (9.12±1.68 min). On comparison of the required time to achievement of sensory block between groups, required time was 6-10 minute in 23(76.6%) patients of group-A versus 19(63.3%) in Group-B patients. The result was non-significant (p value > 0.05).

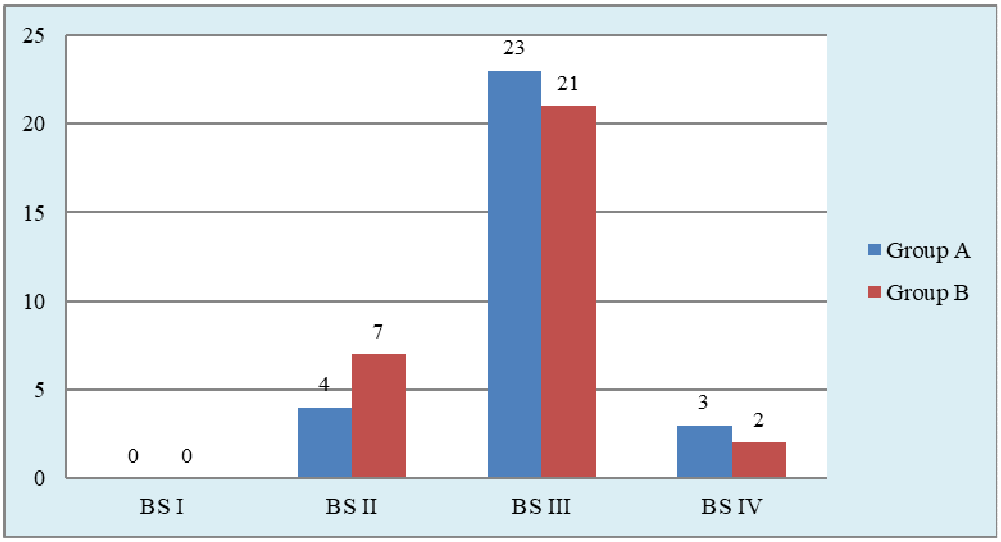

Figure- III: Assessment of Bromage scale and time to onset of motor block (N=60)

Figure III showed the Bromage scale between groups at 10th minute time. Onset of motor block was 12.26± 3.96 min in Group A patients and 11.58±3.68 min in Group B patients. The difference was statistically non-significant. Time taken to achieve Bromage 3 following anaesthesia was considered as onset of motor block. An average Bromage score of 4 was achieved for the motor block in both groups (p=0.968)

Table 5: Distribution of patients according to time of onset of motor block (N=60)

Time (min)	Number of Patient		p- Value
	Group A (n=30)	Group B (n=30)	
≤10	4(13.3%)	7(23.3%)	0.317^{ns}
6-10	23(76.7%)	21(70.0%)	0.559^{ns}
>10	3(10.0%)	2(6.7%)	0.640^{ns}
Mean ± S.D.	12.26 ± 3.96 min	11.58 ± 3.68 min	0.968^{ns}

Table 5 showed time to onset of motor block. The mean onset time of motor block in group A was 12.26 ± 3.96 min, and 11.58±3.68 min in group B. By evaluating these times, we understood that the required time for initiating motor block in group A was longer than groups B, but the difference between group was statistically non-significant (p Value = 0.968).

Table 6: Distribution of patients according to heart rate per minute (N = 60)

Time	Group A (n=30) Mean ±SD	Group B (n=30) Mean ±SD	p-Value
Pre-operative	88.1±4.7	80.3±5.1	0.036^{s}
5 min	85.1±5.4	83.2±6.2	0.080^{ns}
10 min	84.3±5.2	83.2±4.3	0.209 ^{ns}
15 min	84.6±5.3	82.7±6.4	0.081 ^{ns}

20 min	84.7±5.4	82.8±6.3	0.093 ^{ns}
30 min	83.2±7.6	82.2±5.1	0.399 ^{ns}
45 min	85.4±4.2	86.3±7.2	0.405 ^{ns}
60 min	86.3±5.6	88.2±5.7	0.091 ^{ns}
90 min	86.5±5.8	88.1±5.1	0.111 ^{ns}
120 min	85.4±4.3	86.3±7.1	0.421^{ns}
150 min	86.3±5.7	88.2±5.6	0.195 ^{ns}
180 min	86.5±5.9	88.1±5.7	0.245^{ns}

In the Group A initial heart rate was 88 beats/ minute. In the Group B initial pulse rate was 80 beats/ minute. Clinically and statistically there is no decrease in Pulse Rate in two groups.

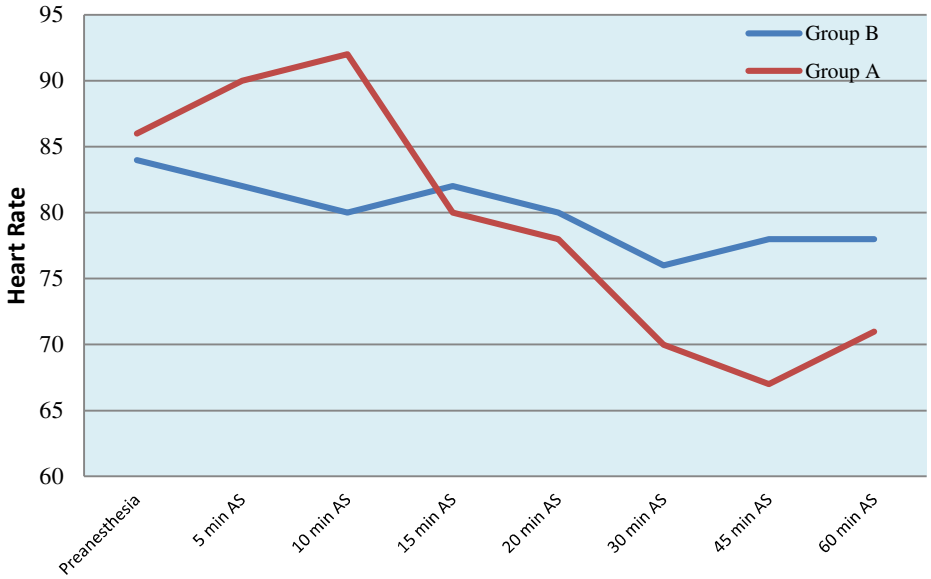

Figure- IV: Trends of heart rate (HR) in the studied group (n=60)

Figure IV showed the heart rate in the studied group. Regarding the heart rate, no significant difference was detected between the groups at the time of preanesthesia and at the 5 min after anaesthesia. Compared with group B patients, group A patient shows slight but statistically significant increased heart rate at the 10 min (80, 92 beat/min respectively) after supraclavicular brachial plexus block. Following that heart rate decreased between B group and A group @ 82 and 80 beat/min at 15th min, 80 and 78 beat/min at 20th min, 76 and 70 beat/min at 30th min, 78 and 67 beat/min at 45th min respectively, but more bradycardia was observed in Group-A. After 45-minute heart rate difference was significant between groups. So that, we found heart rate almost stabilized in B group.

Table 7: Distribution of patients according to systolic blood pressure between groups with respect to time (N=60)

Systolic BP (mmHg)	Group A (n=30) Mean ±SD	Group B (n=30) Mean ±SD	p- Value
Preanesthesia	89.6±6.3	84.3 ±5.0	0.261^{ns}
Range (min-max)	80 -100	80 -95	
5 min AS	92.5 ±6.8	88.4±9.2	0.421^{ns}
Range (min-max)	80 -105	62 -95	
10 min AS	95.3 ±7.1	85.5 ±5.1	0.031^{s}
Range (min-max)	86 -110	80 -110	
15 min AS	95.6 ±11.2	84.3 ±4.8	0.013^{s}
Range (min-max)	85 -110	80 -95	
20 min AS	97.9 ±4.7	88.3 ±5.0	0.041^{s}
Range (min-max)	45 -105	80 -95	
30 min AS	94.6±15.6	90.8 ±5.0	0.082^{ns}
Range (min-max)	90 -105	80 -95	
45 min AS	93.6 ±11.6	89.3 ±8.2	0.156^{ns}
Range (min-max)	80 -105	70 -95	
60 min AS	59.6 ±6.0	61.2 ±9.4	0.467^{ns}
Range (min-max)	45 -110	80 -95	
90 min AS	65.2 ±5.2	64.3 ±8.9	0.634^{ns}
Range (min-max)	50 -112	55 -93	
120 min AS	66.1 ±6.0	65.2 ±10.4	0.683^{ns}
Range (min-max)	55 -110	60 -95	
150 min AS	68.1±6.0	66.2 ±8.5	0.321^{ns}
Range (min-max)	60 -110	60 -80	
180 min AS	64.6 ±7.0	63.2 ±9.4	0.516^{ns}
Range (min-max)	55 -110	50 -95	

Table 7 showed systolic blood pressure during follow up it was observed that at preanesthesia, mean systolic BP was found 89.6±6.3 mmHg in group A and 84.3±5.0 mmHg in group B. At induction, mean systolic blood pressure was 92.5±6.8 mmHg and 81.4±9.2 mmHg in group A and group B respectively. At incision, mean systolic blood pressure was 95.3±7.1 mmHg in group A and 85.5±5.1 mmHg in group B. At 15 minute after, mean systolic blood pressure was 95.6±11.2 mmHg and 84.3±4.8 mmHg in group A and group B respectively. At 30 minute after, mean systolic BP was 97.9±4.7 mmHg in group A and 84.3±5.0 mmHg in group B. At 45 minute after, mean systolic blood pressure was 94.6±15.6 mmHg and 84.3±5.0 mmHg in group A and group B respectively. At 60 minutes after, mean systolic blood pressure was 59.6±6.0 mmHg in group A and 61.2±9.4 mmHg in group B. At 10, 15 and 20-minute difference was statistically significant ($p<0.05$) between two groups.

Table 8: Distribution of patients according to diastolic blood pressure (DBP) between groups with respect to time (N=60)

Diastolic BP (mmHg)	**Group A (n=30) Mean ±SD**	**Group B (n=30) Mean ±SD**	**p- Value**
Preanesthesia	59.6 ±6.0	61.2±9.4	0.348[ns]
Range (min-max)	50 -70	45 -80	
5 min AS	63.9 ±5.2	61.2 ±9.6	0.213 [ns]
Range (min-max)	55 -70	45 -80	
10 min AS	65.4±5.6	62.5 ±9.5	0.186 [ns]
Range (min-max)	55 -75	45 -80	
15 min AS	67.6 ±7.4	61.5 ±9.7	0.013[s]
Range (min-max)	50 -75	45 -80	
20 min AS	65.5 ±7.1	61.9 ±9.7	0.096 [ns]
Range (min-max)	50 -75	45 -80	
30 min AS	66.0 ±6.8	61.2 ±9.4	0.039[s]
Range (min-max)	50 -75	45 -80	
45 min AS	65.2 ±5.6	60.5 ±9.5	0.001[s]
Range (min-max)	55 -75	45 -80	
60 min AS	59.5 ±5.0	60.2 ±7.4	0.432 [ns]
Range (min-max)	50 -70	45 -80	
90 min AS	63.4 ±6.2	64.2 ±7.3	0.649 [ns]
Range (min-max)	55 -75	55 -80	
120 min AS	65.2 ±6.9	64.3 ±6.1	0.594 [ns]
Range (min-max)	60 -75	60 -80	
150 min AS	66.8 ±6.3	65.7 ±6.1	0.494 [ns]
Range (min-max)	60 -75	55 -80	
180 min AS	63.3 ±5.5	64.6 ±6.1	0.389 [ns]
Range (min-max)	55 -75	55 -80	

Regarding diastolic blood pressure during follow up, after 15 minute, 30 minutes, and 45 minutes mean diastolic blood pressure was statistically significant ($p<0.05$) between two groups but other follow up were not significant ($p>0.05$) between two groups.

Table 9: Distribution of patients according to mean arterial pressure (MAP) between groups with respect to time (N=60)

Time point after block	**Mean arterial pressure -MAP (mmHg)**		**p- Value**
	Group A (n=30) Mean ±SD	**Group B (n=30) Mean ±SD**	
Pre-anaesthesia	69.60±11.6	68.93±9.1	0.883[ns]
5 min AS	70.45±8.2	67.90±9.5	0.086 [ns]
10 min AS	75.40±7.9	70.25±10.2	0.0001[s]
15 min AS	76.92±8.1	69.18±9.5	0.0001[s]

20 min AS	76.31±8.6	68.73±9.1	0.0001^{s}
30 min AS	71.57±10.2	69.18±7.5	0.067^{ns}
45 min AS	71.05±9.3	68.46±11.4	0.435^{ns}
60 min AS	59.55±6.8	60.52±7.1	1.082^{ns}
90 min AS	63.45±7.1	62.71±9.12	0.723^{ns}
120 min AS	64.71±7.3	61.8±8.2	0.723^{ns}
150 min AS	65.5±7.3	63.7±8.7	0.389^{ns}
180 min AS	64.46±7.6	62.4±7.12	0.283^{ns}

There was no significant difference between the groups as regards Preanaesthetic period MAP (p=0.883), but after anesthesia significant decrease in MAP was seen in all groups compared with basal MAP, the least decrease occurring in the group A and the highest fall in the group B. At the 15th minute MAP was 76.92 and 69.18 mm of Hg in group A and group B respectively showing significant difference (p=0.0001), After 45 minute, mean blood pressure was 71.05±6.8 mmHg in group A and 68.46±9.4 mmHg in group B. Which statistically significant (p<0.05) between two groups but follow up after 60, 90, 120, 150 and 180 minutes mean BP stabilized to similar in both group, which was statistically not significant (p>0.05) between two groups.

Table 10: Distribution of patients according to mean duration of motor and sensory block between two groups (N=60)

Variable	**Duration of motor and sensory block (min)**		**p-Value**
	Group A (n=30) Mean ±SD	**Group B (n=30) Mean ±SD**	
Duration of sensory block (min)	457.13±36.12	428.15±31.42	0.001^{s}
Duration of motor block (min)	408.68±26.96	380.26±24.11	0.001^{s}

The duration of sensory blockade, defined as the time between onset of sensory block and return of dull pain but VAS<3. The duration of motor block was assessed every 10 minutes till the ability of the patient to first move the fingers. Sensory and motor block lasted longer in the group-A patients as compared to the Group-B, the difference was statistically significant (p<0.05). Present study shows that duration of motor block was 408.68±26.96 min and 380.26 ± 24.11 min in group A and Group B respectively. Sensory block was 457.13±36.12 min and 428.15±31.42 min in group A and Group B respectively, which is statistically significant difference between two groups (p<0.05).

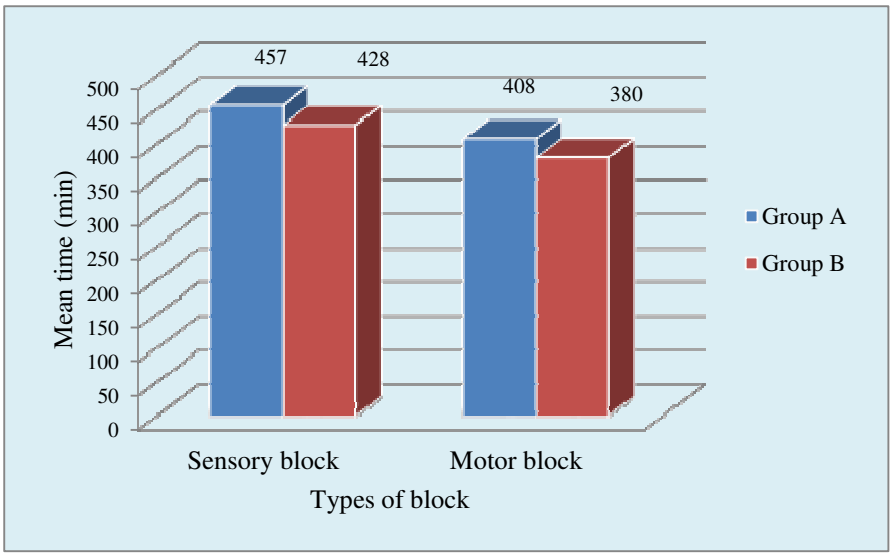

Figure- V: Mean duration (min) of motor and sensory block (N=60)

DISCUSSION

In present study showed no significant difference between groups in respect of demographic variables and ASA status (p>0.05). In accordance Sayed et al.[8] reported non-significant differences between study groups as regards to age, sex, ASA and body weight variations. In this study onset of sensory and motor block was faster in Group A than Group B., but the difference between group was statistically non-significant. Nath et al.[9] found that the use of magnesium caused a delay in onset of sensory and motor block, but it was statistically insignificant. Similar results were observed by Khezri et al.[10] and Malleeswaran et al.[11] The mean onset of sensory block in case Group M was 15.5±2.16 and the onset block in control Group P was 12.73±1.18 (p<0.49). The mean onset of motor block in case Group M was 23.5±1.1 and the onset block in control Group P was 41±3 (p<0.53).[12] In our study, haemodynamics was not statistically significant (p>0.05) between two groups. Hamed et al.[13] illustrated that there is no statistically significance difference with P>0.05 between study groups as regards the intraoperative HR follow-up in the 1st hr., which indicated all groups of drugs had same effect on intraoperative HR. In present study showed the duration of sensory and motor block was significantly increased in Group A compare to Group B (p<0.05). Study by Rao et al[12] demonstrated that addition of magnesium sulfate to 0.5% bupivacaine increased the duration of motor and sensory supraclavicular brachial block in the upper extremities during surgeries when compared to the use of 0.5% bupivacaine alone. In their study 30 patients having received 0.5% bupivacaine plus magnesium and the other 30 patients having received 0.5% bupivacaine plus normal saline. The mean sensory block duration in the case Group M was 249±9.36 and in control Group P was 160±5.62 (p<0.39). The mean motor block duration in the case Group M was 232±9.64 and in control Group P was 147±26.52 (both p<0.32). Through statistically not significant but definitely in clinically significant. Fentanyl used with bupivacaine in our study prolonged the duration of sensory and motor blockade, probably by directly binding with opioid binding sites on the dorsal nerve roots aided with these axonal transport or by diffusing into surrounding tissues and subsequently into the epidural and subarachnoid spaces, it may also have been

central opioid receptor mediated after systemic absorption of fentanyl. Another study uses of opioids for brachial plexus block have reported to prolong the analgesic duration with or without the use of local anaesthetics.[6] Madusudhan et al (2011) demonstrated a significant increase in the duration of sensory, motor blockade on addition of fentanyl to ropivacaine 0.75% for brachial plexus blocks compared to ropivacaine used alone, which were similar to our study results. In our study, the addition of fentanyl to local anesthetics for brachial plexus block (Group-A) improved the success rate of nerve block.14 Rajkhowa T et al (2016)[15] showed that, Supraclavicular brachial plexus block was performed in the group R using 0.5% ropivacaine and in group RF received 0.5% ropivacaine plus 50 micrograms fentanyl. Compared to group R, group RF showed a significant greater duration of sensory and motor blockade (*P*=0.0001). The addition of fentanyl to ropivacaine significantly prolonged the duration of analgesia compared to ropivacaine used alone for supraclavicular brachial plexus blocks in patients undergoing forearm surgeries.[15] The analgesic/antinociceptive effect of opiates is primarily mediated at the central and/or spinal cord level. Some studies have reported the existence of peripheral functional opioid receptors in animals, but their existence in human peripheral tissue is still doubtful. In present study showed no significant difference of mean time for requirement of rescue analgesic between Group A and Group B (p=0.127). No significant difference of total number of rescue analgesics between Group A and Group B (p=0.640). In accordance Hamed et al.[13] reported postoperative VAS values at 24 hours were significantly lower in group M than group N. Another study[16] reported adding magnesium sulfate to supraclavicular brachial plexus block may increase the sensory and motor block duration and time to first analgesic use, and decrease total analgesic needs, with no side effects. In their study one hundred patients undergone supraclavicular brachial plexus block were divided into two equal groups). In group RM (n=50), 30 ml 0.5% ropivacaine plus 150 mg magnesium sulfate and in group RN (n=50), 30 ml 0.5% ropivacaine plus 1 ml normal saline were administered in supraclavicular block. The mean time from block placement to first request for pain medication, that is, the duration of analgesia was 461.71 min in the Magnesium sulfate group but 379.79 min in the normal saline group. This difference (about 81.92 min) was statistically significant (P = 0.02). Group RM required less amount of diclofenac sodium injection as rescue analgesics than patients in group RN (saline group) in first 24 h of postoperative period.[16] From this study it is found that magnesium sulphate as well as fentanyl as an adjuvant to bupivacaine prolongs the duration of sensory and motor block in supraclavicular brachial plexus block; but fentanyl is better than magnesium sulphate in this aspect.

LIMITATIONS OF THE STUDY

The present study was conducted in a very short period of time. All the patients admitted to Bangladesh Medical College and Hospital, Dhaka was taken for the study. So this will not reflect the overall picture of the country.

CONCLUSIONS AND RECOMMENDATIONS

Magnesium sulphate chloride, as well as fentanyl as an adjuvant to bupivacaine, prolongs supraclavicular brachial plexus block. Fentanyl as magnesium sulphate chloride should be used as an adjuvant. Further studies could be undertaken by including a large number of patients in multiple tertiary hospitals.

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