Original Research Article

Comparison of magnesium sulphate and dexmedetomidine as an adjuvant to bupivacaine for supraclavicular brachial plexus block using nerve stimulator a prospective double blind randomised control study

Vinay M S[1], Mamtaz A[2], Ann Susan Matthew[3], Sreeharsha B[4*]

[1]Senior Resident, Department of Anesthesiology, Shimoga Institute of Medical Sciences, Shimoga, Karnataka India

[2]Senior Resident, Department of Anesthesiology, Bangalore Medical College and Research Institute, Bangalore, Karnataka, India

[3]Senior Resident, Department of Anesthesiology, Mysore Medical College and Research Institute, Mysore, Karnataka, India

[4]Department of Anesthesiology, Mallya Hospital, Bangalore, Karnataka, India

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Abstract

Background and Objective: Supraclavicular brachial plexus block is one of the most commonly used regional techniques for most of the upper limb orthopedic surgeries. Various adjuvants have been used to prolong the block duration. Nowadays opioid free anesthesia is being practiced more; non opioid drugs like Dexmedetomidine and Magnesium sulphate both are superior in their action of early onset and prolongation of sensory and motor blockade when added to Las. **Material and Methods:** We have taken120 ASA I/II patients aged between 20–60 years of both sex, posted for elective upper limb orthopedic surgeries were enrolled in a prospective double blind randomized control study after informed consent. The studies conducted in Krishna Rajendra Hospital attached to Mysore Medical College and Research Institute, Mysore. The 120 patients were randomly allocated in 2 groups and 50 patients received Bupivacaine 0.5% 29.5ml + Dexmedetomidine 50µg. (Group DB) and 50 patients received Bupivacaine 0.5% 29.5ml + Magnesium sulphate 250mg. (Group MB). Under aseptic precautions supraclavicular brachial plexus block was done using perivaascular Nerve stimulator technique using study drugs. The duration onset of sensory and motor blockade, total duration of sensory and motor blockade, haemodynamic status during the peri-operative period and any other side effects were monitored. The technique acceptance by the patient and also the rescue analgesia required are studied during the post-operative period. **Results:** The onset of sensory and motor blockade was faster in Group DB. The onset time for sensory block was 8.00±0.93 min in Group DB and 12.59±1.15 min in Group MB with statistical significance of P <0.001. The onset time for motor blockade was 11.31±1.40 min Group DB and 17.78±1.27 min in Group MB with statistical significance of P <0.001. Duration of sensory and motor blockade both were significantly prolonged in Group DB. Duration of sensory blockade was 632.72±58.56 min in Group DB and 308.60±26.52 min in Group MB with statistical significance of P < 0.001. Duration of motor blockade was 472.80±26.86 min in Group DB and 274.60±26.93 min in Group MB with statistical significance of P < 0.001. There were no adverse events noted in either group. All patients were haemodynamically stable without requiring any intervention. **Conclusion:** The addition of Magnesium sulphate and Dexmedetomidine to Bupivacaine for Supraclavicular brachial plexus block produces significant early onset of sensory and motor blockade also prolonged the total duration of sensory and motor blockade without much side effects. In comparison to Magnesium sulphate addition of Dexmedetomidine has more prolongation of sensory and motor blockade, requiring less sedative drugs and better patient acceptance during post-operative period as an advantage.

Key words: Dexmedetomidine; Magnesium sulphate; Bupivacaine; Supraclavicular Brachial plexus block; Nerve stimulator.

Introduction

Anaesthesia has evolved into a speciality subject over decades with lots of improvement in the methods employed and drugs used to provide anaesthesia with least complications. General anaesthesia (GA) was one of the most common methods employed to provide anaesthesia for upper limb surgeries. With the introduction of newer and safer local anaesthetics and better advantage, regional anesthesia has taken over as the principle technique for upper limb surgeries.

*Correspondence
Dr. Sreeharsha B
Department of Anesthesiology, Mallya Hospital, Bangalore, Karnataka, India.
E-mail: sreeharsha8839@gmail.com

There are many advantages1 of brachial plexus block (BPB) for upper limb surgeries over general anaesthesia, namely Effective analgesia with good motor blockade, Awake patient, Extended post operative analgesia, Early ambulation, Early resumption of oral feeding, Minimal number of drugs used so that poly pharmacy is avoided, No airway manipulation, Decreased incidence of post operative nausea and vomiting, Ideal operative condition can be met.

Orthopaedic procedure of forearm and hand are well suited for regional anaesthetic techniques. Various approaches[1,2] of brachial plexus block have been used for upper limb surgeries namely Interscalene approach, Supraclavicular approach, Infraclavicular approach, Axillary approach.

Among these approaches supraclavicular and infraclavicular techniques are more effective in producing complete anaesthesia of all the branches of brachial plexus, as the narrowest part of the plexus is encountered by these techniques.

Local anaesthetic drugs are widely used throughout anaesthetic practice, but the limited duration of action of various local anaesthetics continues to be a matter of concern for anaesthesiologists. A variety of peri-neural adjuvant drugs have been tried to hasten the time of onset and prolong the duration of analgesia of nerve blocks with varying degrees of success[4,5,6]. Many drugs have been used as adjuvants to local anesthetic agents to prolong the duration of peripheral nerve blocks and decrease the time of onset. Opioids, ketamine, dexamethasone, tramadol, Clonidine and few others drug have been reported to prolong the duration of anesthesia and analgesia during such blocks[7,8,9] all the adjuvants have some side effects and limitation on the basis of their mechanism of action.

Dexmedetomidine is highly selective (8 times more selective than clonidine) and a specific α2 adrenergic agonist, having analgesic, sedative, antihypertensive and it has anaesthetic sparing effects when given by the systemic route. Dexmedetomidine produces manageable hypotension and bradycardia, but the striking feature of this drug is the lack of opioid-related side effects such as respiratory depression, pruritis, nausea and vomiting. Addition of Dexmedetomidine to local anaesthetic drugs during peripheral nerve blocks may also decreases the onset of analgesia and prolongs the post-operative analgesia which is beneficial for surgical patients.

There are only few studies which have been done to assess the effect of both the drugs. Hence our study is to compare both the drugs for addition to SCBPB as an adjuvant with local anaesthetics and to compare their efficacy in providing post-operative analgesia.

Objectives

To comparison of magnesium sulphate and dexmedetomidine as an adjuvant to bupivacaine for supraclavicular brachial plexus block using nerve stimulator

The primary objectives are to compare

-onset of duration and total duration of sensory block.
-onset of duration and total duration of motor block.

Secondary objectives being

- Hemodynamic, Respiratory and PONV
- Requirement of rescue analgesics
- Patient and Surgeons acceptance.

Materials and methods

A prospective double blind randomized control study entitled "Comparison of Magnesium Sulphate And Dexmedetomidine As An Adjuvant To Bupivacaine For Supraclavicular Brachial Plexus Block Using Nerve Stimulator" was undertaken in K R Hospital attached to Mysore Medical College and Research Institute, Mysore, during the period from November 2017 to July 2019. The study was undertaken after obtaining ethical and clinical committee clearance as well as informed consent from all patients.

120 patients aged between 20-60 years with ASA class I and II, posted for elective upper limb orthopaedic surgeries (forearm and hand) were selected and grouped randomly for our study. Randomization was done using simple opaque sealed envelope method. The envelope was opened by the senior anesthesiologist who will prepare the study drug.

1. Group DB (Bupivacaine +Dexmedetomidine) – 50 patients receives 29.5ml of 0.5% Bupivacaine with 0.5ml of 50 µg of Dexmedetomidine.
2. Group MB (Bupivacaine + Magnesium) – 50 patients received 29.5ml of 0.5% Bupivacaine with Magnesium Sulphate 250mg (0.5ml)

Inclusion Criteria

- Patients belonging to ASA Grade I & II.
- Patients with age group of 20-60 years.
- Patients with weighing 50 – 80 kilograms.
- Forearm and hand surgeries.

Exclusion Criteria

- ASA class III, IV and V
- Patient refusal for procedure
- Patients with coagulation disorder
- Patients with neurological disorder in brachial plexus
- Patients having history to study drugs
- Local infection at the injection site
- Severe obesity/ Body mass index >35

Preoperative evaluation was done in all the patients on the day before surgery. A routine examination was conducted assessing General condition of the patient, Airway assessment, Nutritional status, weight and height of the patient, A detailed examination of all vital system of the body, History of medication.

The following investigations were done in all the patients Hemoglobin estimation, Urine examination for albumin, sugar and microscopy, Standard 12 lead ECG, Fasting blood sugar, Blood urea and serum creatinine.

All patients were preoperatively evaluated for any systemic diseases and investigations done prior to assessment. Procedure was explained in detail and written informed consent was obtained. The procedure was carried out in the theatre, where facilities for resuscitation was available.

All patients included in the study were premedicated with tablet Alprazolam 0.5 mg and Ranitidine 150 mg orally at night before surgery and were kept nil orally for solid – 8hr, semisolid – 6 hr, clear liquid – 4 hr.

On arrival of patients in the operating room, a18 gauge intravenous cannula was inserted under local anaesthetic infiltration on the non operating hand and infusion of normal saline was started. All patients were premedicated with I.V 1 mg Midazolam and 15 mg Pentazocin half an hour before giving the block. The patients were connected to **Star plus of Larsan and Toubro multi parameter** monitor to record heart rate (HR), non invasive measurement of systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), continuous electrocardiogram (ECG) monitoring and haemoglobin oxygen saturation (SpO2). The baseline blood pressure and heart rate were recorded.

The patients were placed in dorsal recumbent position with the head tilted 45º away from the site of injection. Under aseptic precautions painting and draping done, skin infiltration done with Lidocaine 1% at the site of block prior to block placement. Supraclavicular plexus block procedure is done using nerve stimulation (**NS**) technique and the response to NS with current intensity of 0.4 mA, study drug was injected with 3 ml increments after negative aspiration test. An intercostobrachial nerve block was then performed separately using 5 ml of 0.25% Bupivacaine to avoid tourniquet pain to all patients. Immediately after block placement, patients were evaluated every 1 minute for the assessment of onset of sensory and motor blockade, quality of motor blockade, overall quality of the block, duration of sensory and motor blockade and haemodynamic variables. Sensory blockade was assessed by pin prick test and motor blockade was assessed by Modified Bromage Scale. Assessments were carried out every 1 minute till 5 min then, every 5 min till 30 min then, every 30 min till 6 hr for the achievement of **sensory and motor blocks**. Sensory block was assessed by **HOLLMEN'S SCALE as** Grade 1= 0 – Normal sensation of pin prick, Grade 2= + - Pin prick felt as sharp pointed but weaker compared with the same area in other extremity, Grade 3= ++ - Pin prick felt as touch with blunt object, Grade 4= +++ - No perception of pin prick. Motor block was assessed by using **Modified Bromage Scale** Grade 1= 0 – Able to raise the extended arm to 90degrees for a full 2 seconds, Grade 2= + - Able to flex the elbow and move the fingers but unable to raise the extended arm, Grade 3= ++ - Unable to flex the elbow but able to move the fingers, Grade 4= +++ - Unable to move the arm, elbow, or the fingers. Postoperative pain levels were assessed by 10 cm **visual analogue scale (VAS)** from 0 (no pain) to 10 (severe pain). Sedation was assessed by using **Ramsay sedation Scale:** score 1= Anxious or restless or both, score 2=Cooperative, orientated and tranquil, score 3= Responding to commands, score 4= Brisk response to stimulus,

score 5= Sluggish response to stimulus, score 6 = No response to stimulus.

After 30 minutes if the block was considered to be adequate, surgeons were allowed to apply the tourniquet and start the surgery. If the block was considered to be inadequate for surgery, the patient was given general anaesthesia with endotracheal intubation.

During the surgery tourniquet time, hemodynamic variables like HR, SBP, DBP, MAP, SpO2, ECG were monitored 5th and 10th minute and then every 10 minute till the completion of the surgery, later every 30 minutes till 5 hrs post block, every 60 minutes until complete recovery. Patients were monitored for cardiovascular or central nervous system toxicity throughout the study. Any hypersensitivity reaction for the drugs, evidence of pneumothorax, and other adverse events were also monitored. To evaluate sensation, patients were asked to document the time when incisional discomfort began and the time when full power returned to the shoulder. In the post operative period, when the patient complainedof pain at t he operative site, infusion Paracetamol 1g was given and study was concluded. Patients were followed up for 24 hrs for any side effects.

Adverse effects

signs of cardiovascular system toxicity like changes in HR, BP, rhythm and signs of central nervous system stimulation. Also looked for hypersensitivity reaction for the drug and for the evidence of pneumothorax, nausea, vomiting, purities, jerking movements, Horner's syndrome. For statistical analysis complete failure and unsatisfactory blocks were considered as failures and compared with satisfactory block. The results of the study were statistically analysed between the two groups using independent–samples t–test. $p<0.05$ is considered as statistically significant, $p>0.05$ is considered as statistically not significant.

Results

Table 1: Distribution of subjects according to sex among two groups

Sex	Group DB	Group MB	Total
Female	25	16	41
	50.0%	32.0%	41.0%
Male	25	34	59
	50.0%	68.0%	59.0%
Total	50	50	100
	100.0%	100.0%	100.0%

In our study out of total 100 patients in DB group 25 were female, 25 were male and distribution was 50%. In MB group 16 were female, 34 were male and distribution was 32% female, 68% male. So the total distribution was 41% female and 59% male. There was no statistical / clinical significance in sex distribution. P value was 0.13.

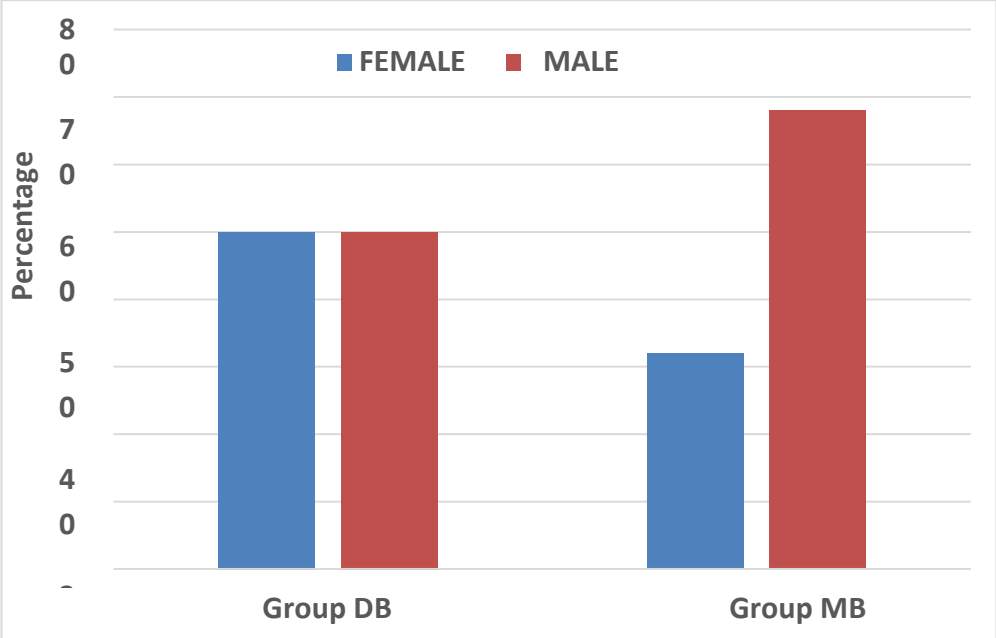

Fig 2: Graph showing Distribution of subjects according to sex among twogroups

Table 2: Comparison of mean Age and BMI between two groups

	Group DB		Group MB		P value
	Mean	SD	Mean	SD	
Age (year)	42.22	8.79	44.60	11.05	0.236
BMI	26.45	2.39	25.91	2.03	0.217

In DB group the lowest age of patient was 22 years and highest age was 58 years. The mean age of DB group was 42.22 years and standard deviation was 8.79. In MB group lowest age of patient was 24 years and highest age was 63 years. The mean age of MB

group was 44.60 years and standard deviation was 11.05. There was no statistical / clinical significance in age distribution. P value was 0.236.

In DB group the lowest BMI of patient was 20.2 kg/m^2 and highest BMI was 30.5 kg/m^2. The mean BMI of DB group was 26.45 kg/m^2 and standard deviation was 2.39. In MB group lowest BMI of patient was 21.2 kg/m^2 and highest BMI was 29.4 kg/m^2. The mean BMI of MB group was 25.91 kg/m^2 and standard deviation was 2.03. There was no statistical / clinical significance in age distribution. P value was 0.217.

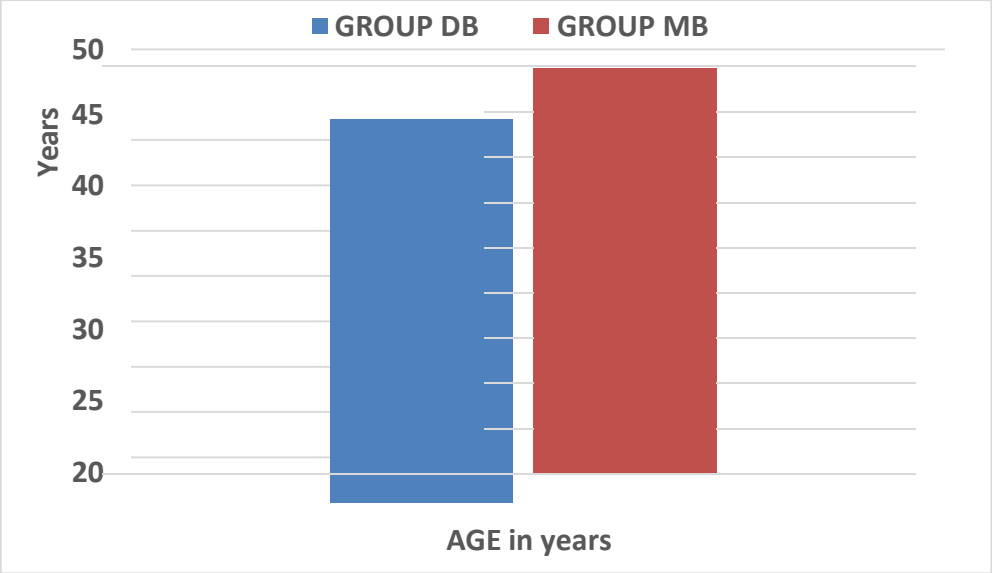

Fig 3: Graph showing Comparison of mean Age between two groups

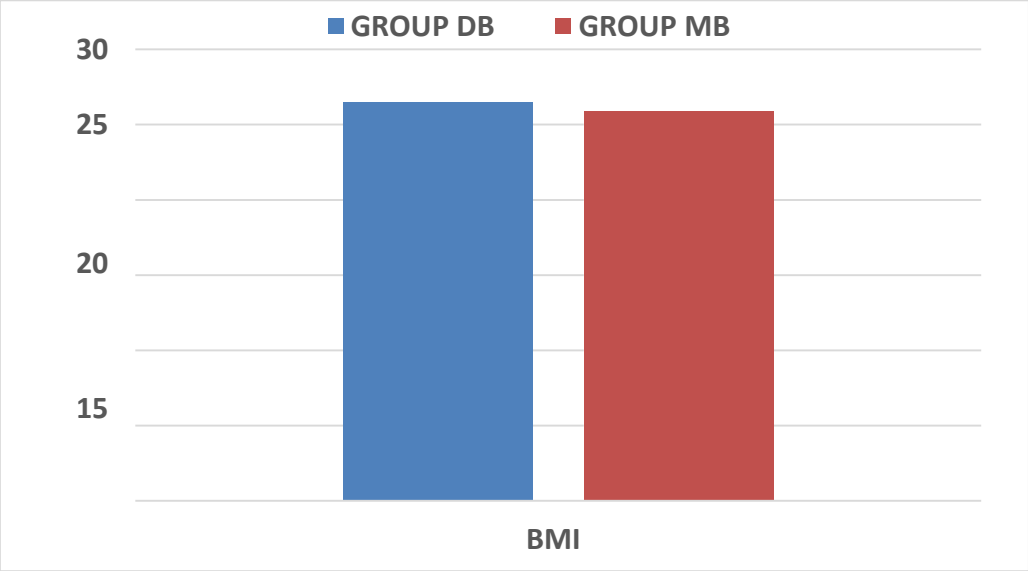

Fig 4: Graph showing Comparison of mean BMI between two groups

Table 3: Distribution of subjects according to ASA among two groups

ASA	Group DB	Group MB	Total
I	25	27	52
	50.0%	54%	52.0%
II	25	23	48
	50.0%	46%	48.0%
Total	50	50	100
	100.0%	100.0%	100.0%

In our study out of total 100 patients in DB group 25 patients were belong to ASA I, 25 patients were belong to ASA II and distribution was 50%. In MB group 27 patients were belong to ASA I, 23 patients were belong to ASA II and distribution was 54% ASA I, 46% ASA II. So the total distribution was 52% ASA I and 48% ASA II. There was no statistical / clinical significance in ASA grading distribution. P value was 0.688.

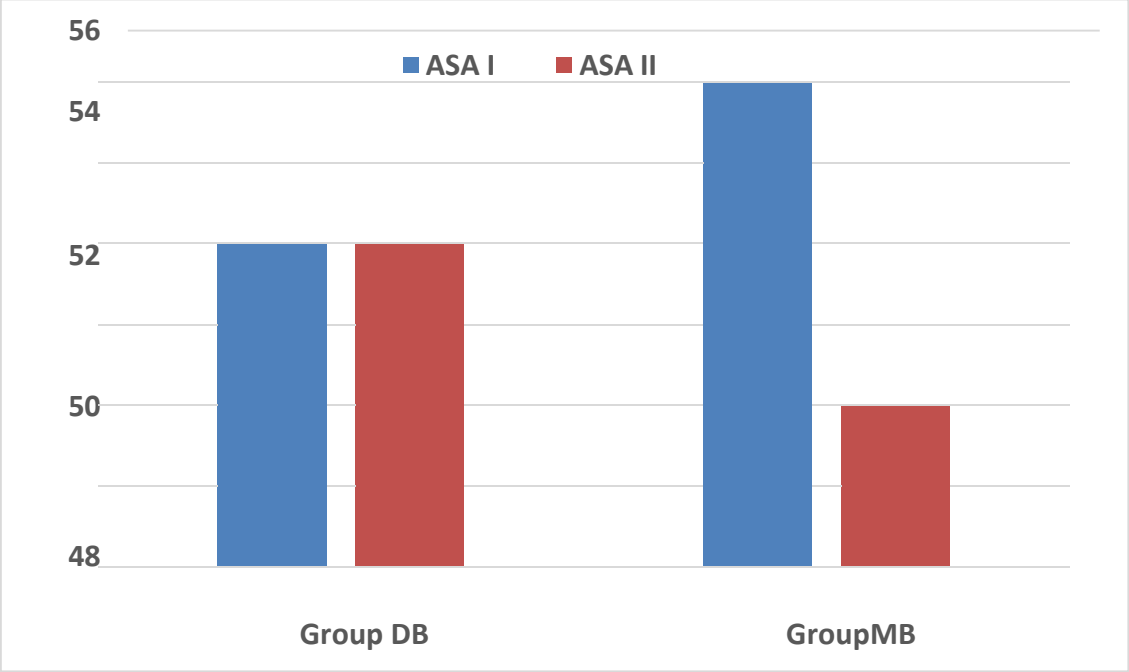

Fig 5: Graph showing Distribution of subjects according to ASA among two groups

Table 4: Comparison of Sensory block onset between two groups

	Group DB		Group MB		
	Mean	SD	Mean	SD	P value
Sensory Block onset(min)	8.00	0.93	12.59	1.15	<0.001

In our study results shows that the sensory block onset time was 8.00±0.93 min in Group DB where as sensory block onset time was 12.59±1.15 min in Group MB. Thus Dexmedetomidine shorten the sensory blockade onset which was statistically significant (p<0.001).

Table 5: Comparison of Motor block onset between two groups

	Group DB		Group MB		
	Mean	SD	Mean	SD	P value
Motor Block onset(min)	11.31	1.40	17.78	1.27	<0.001

In our study results shows that the motor block onset time was 11.31±1.40 minin Group DB where as motor block onset time was 17.78±1.27 min in Group MB. Thus Dexmedetomidine shorten the motor blockade onset which was statistically significant (p<0.001).

Table 6: Comparison of Sensory blockade duration between two groups

	Group DB		Group MB		
	Mean	SD	Mean	SD	P value
Sensory block duration (min)	632.72	58.56	308.60	26.52	<0.001

In our study results shows that the sensory blockade duration was 632.72±58.56 min in Group DB where as sensory blockade duration was 308.60±26.52 min in Group MB. Thus Dexmedetomidine prolongs the duration of sensory blockade which was statistically significant (p<0.001).

Table 7: Comparison of motor blockade duration between two groups

	Group DB		Group MB		
	Mean	SD	Mean	SD	P value
Motor blockade duration (min)	472.80	26.86	274.60	26.93	<0.001

In our study results shows that the motor blockade duration was 472.80±26.86 min in Group DB where as motor blockade duration was 274.60±26.93 min in Group MB. Thus Dexmedetomidine prolongs the duration of motor blockade which was statistically significant (p<0.001).

Table 8: Comparison of Duration of surgery and Tourniquet time between two groups

	Group DB	Group MB	

	Mean	SD	Mean	SD	P value
Duration of surgery	87.40	10.46	89.00	11.11	0.460
Tourniquet time (min)	79.6	9.14	83.14	9.64	0.07

In our study the mean duration of surgery was 87.40±10.46 min in group DB whereas in group MB it was 89.00±11.11 min. The mean duration of tourniquet time was 79.6±9.14 min in group DB whereas in group MB it was 83.14±9.64 min. The duration of surgery and tourniquet time was not statistically significant in both the groups. P value for duration for surgery was 0.460. P value for tourniquet time was 0.07.

Table 9: Comparison of heart rate between two groups at various time interval

Heart rate	Group DB		Group MB		P Value
	Mean	SD	Mean	SD	
Baseline	83.90	10.65	82.72	10.76	0.583
5 min	82.40	10.82	86.58	11.60	0.065
10 min	80.02	10.19	82.34	11.09	0.074
20 min	77.52	9.52	82.64	12.12	0.021
30 min	75.04	8.75	80.72	13.81	0.016
40 min	72.50	7.86	80.92	11.79	<0.001
50 min	70.20	7.67	82.86	9.97	<0.001
60 min	67.38	6.94	82.28	9.93	<0.001
70 min	65.39	6.47	83.54	11.20	<0.001
80 min	64.20	6.17	85.25	12.56	<0.001
90 min	62.80	6.56	85.81	12.69	<0.001
100 min	62.71	6.88	85.03	10.38	<0.001

In our study at baseline the HR in Group DB was 83.90±10.65 bpm and in Group MB was 82.72±10.76 bpm which was statistically not significant. At 5 min the HR in Group DB was 82.40±10.82 bpm and in Group MB was 86.58±11.60 bpm which was statistically not significant. At 10 min the HR in Group DB was 80.02±10.19 bpm and in Group MB was 82.34±11.09 bpm which was statistically not significant. At 20 min the HR in Group DB was 77.52±9.52 bpm and in Group MB was 82.64±12.12 bpm which was statistically not significant. Thus from baseline to 20 min intra-operatively the HR was not statistically not significant as P value was not <0.05. But at 30 min mean HR in Group DB was 75.04±8.75 bpm and in Group MB was 80.72±13.81 bpm which was statistically significant as the P value was 0.016. AT 40 min mean HR in Group DB was 72.50±7.86 bpm and in Group MB was 80.92±11.79 bpm which was statistically significant. AT 50 min mean HR in Group DB was 70.20±7.67 bpm and in Group MB was 82.86±9.97 bpm which was statistically significant.

AT 60 min mean HR in Group DB was 67.38±6.94bpm and in Group MB was 82.28±9.93 bpm which was statistically significant. AT 70 min mean HR in Group DB was 65.39±6.47bpm and in Group MB was 83.54±11.20 bpm which was statistically significant. AT 80 min mean HR in Group DB was 64.20±6.17 bpm and in Group MB was 85.25±12.56bpm which was statistically significant. AT 90 min mean HR in Group DB was 62.80±6.56 bpm and in Group MB was 85.81±12.69 bpm which was statistically significant. AT 100 min mean HR in Group DB was 62.71±6.88 bpm and in Group MB was 85.03±10.38 bpm which was statistically significant. Thus from 40 min to 100 min the mean HR was decreased in Group DB which was statistically significant as the P value was <0.001.

Table 10: Comparison of SBP between two groups at various time interval

SBP	Group DB		Group MB		P value
	Mean	SD	Mean	SD	
Baseline	130.48	11.64	124.96	13.22	0.029
5 min	131.68	11.46	134.98	17.94	0.276
10 min	129.22	10.78	132.24	15.74	0.266
20 min	126.76	9.62	123.76	16.54	0.270
30 min	124.28	8.82	122.06	14.64	0.361
40 min	121.22	8.22	121.08	12.78	0.958
50 min	118.50	8.22	120.60	11.38	0.293
60 min	115.92	7.57	123.42	12.71	0.001
70 min	112.65	6.68	125.12	11.44	<0.001
80 min	110.86	6.22	122.76	10.88	<0.001
90 min	109.47	5.94	124.36	12.54	<0.001
100 min	107.77	5.31	124.05	11.02	<0.001

In our study at baseline the SBP in Group DB was 130.48±11.64 mmHg and in Group MB was 124.96±13.22 mmHg which was statistically not significant. At 5 min the SBP in Group DB was 131.68±11.46 mmHg and in Group MB was 134.98±17.94 mmHg which was statistically not significant. At 10 min the SBP in Group DB was 129.22±10.78 mmHg and in Group MB was 132.24±15.74 mmHg which was statistically not significant. At 20 min the SBP in Group DB was 126.76±9.62 mmHg and in Group MB was 123.76±16.54 mmHg which was statistically not significant. At 30 min mean SBP in Group DB was 124.28±8.82 mmHg and in Group MB was 122.06±14.64 mmHg which was statistically not significant. AT 40 min mean SBP in Group DB was 121.22±8.22 mmHg and in Group MB was 121.08±12.78 mmHg which was statistically not significant. AT 50 min mean SBP in Group DB was 118.50±8.22 mmHg and in Group MB was 120.60±11.38 mmHg which was statistically not significant. Thus from base line to 50 min intra-operatively the mean SBP was statistically not significant as the P value was not <0.05. But at 60 min mean SBP in Group DB was 115.92±7.57 mmHg and in Group MB was 123.42±12.71 mmHg which was statistically significant. AT 70 min mean SBP in Group DB was 112.65±6.68 mmHg and in Group MB was 125.12±11.44 mmHg which was statistically significant. AT 80 min mean SBP in Group DB was 110.86±6.22 mmHg and in Group MB was 122.76±10.88 mmHg which was statistically significant. AT 90 min

mean SBP in Group DB was 109.47±5.94 mmHg and in Group MB was 124.36±12.54 mmHg which was statistically significant. AT 100 min mean SBP in Group DB was 107.77±5.31 mmHg and in Group MB was 124.05±11.02 mmHg which was statistically significant. Thus from 60 min to 100 min the mean SBP was decreased in Group DB which was statistically significant as the P value was <0.001.

Table 11: Comparison of DBP between two groups at various time interval

DBP	Group DB		Group MB		P value
	Mean	SD	Mean	SD	
Baseline	74.00	7.17	75.74	13.18	0.414
5 min	75.42	7.20	76.44	12.72	0.312
10 min	73.38	6.65	75.80	12.27	0.111
20 min	71.84	6.48	75.42	13.35	0.091
30 min	70.20	6.09	74.66	11.81	0.020
40 min	70.36	4.92	74.08	10.93	0.014
50 min	65.62	5.03	74.98	9.73	<0.001
60 min	65.78	4.09	77.12	10.21	<0.001
70 min	64.24	3.96	77.40	11.40	<0.001
80 min	62.55	2.96	75.87	10.56	<0.001
90 min	62.23	2.86	78.41	9.41	<0.001
100 min	62.15	2.34	77.75	9.12	<0.001

In our study at baseline the DBP in Group DB was 74.00±7.17 mmHg and in Group MB was 75.74±13.18 mmHg which was statistically not significant. At 5 min the DBP in Group DB was 75.42±7.20 mmHg and in Group MB was 76.44±12.72 mmHg which was statistically not significant. At 10 min the DBP in Group DB was 73.38±6.65 mmHg and in Group MB was 75.80±12.27 mmHg which was statistically not significant. At 20 min the DBP in Group DB was 71.84±6.48 mmHg and in Group MB was 75.42±13.35 mmHg which was statistically not significant. Thus from base line to 20 min intra-operatively the mean DBP was statistically not significant as the P value was not <0.05. But at 30 min mean DBP in Group DB was 70.20±6.09 mmHg and in Group MB was 74.66±11.81 mmHg which was statistically significant. AT 40 min mean DBP in Group DB was 68.36±4.92 mmHg and in Group MB was 74.08±10.93 mmHg which was statistically significant. AT 50 min mean DBP in Group DB was 65.62±5.03 mmHg and in Group MB was 74.98±9.73 mmHg which was statistically significant. At 60 min mean DBP in Group DB was 65.78±4.09 mmHg and in Group MB was 77.12±10.21 mmHg which was statistically significant. AT 70 min mean DBP in Group DB was 64.24±3.96 mmHg and in Group MB was 77.40±11.40 mmHg which was statistically significant. AT 80 min mean DBP in Group DB was 62.55±2.96 mmHg and in Group MB was 75.87±10.56 mmHg which was statistically significant. AT 90 min mean DBP in Group DB was 62.23±2.86 mmHg and in Group MB was 78.41±9.41 mmHg which was statistically significant. AT 100 min mean DBP in Group DB was 62.15±2.34 mmHg and in Group MB was 77.75±9.12 mmHg which was statistically significant. Thus from 40 min to 100 min the mean DBP was decreased in Group DB which was statistically significant as the Pvalue was <0.001.

Table 12: Comparison of MAP between two groups at various time interval

MAP	Group DB		Group MB		P Value
	Mean	SD	Mean	SD	
Baseline	92.96	7.29	91.94	12.16	0.612
5 min	93.72	7.39	95.44	13.33	0.214
10 min	91.86	7.02	97.82	12.09	0.068
20 min	89.78	6.35	91.32	13.55	0.468
30 min	88.00	6.13	90.24	11.96	0.242
40 min	85.52	5.22	89.06	10.35	0.033
50 min	84.56	5.35	89.50	9.14	0.001
60 min	82.46	4.81	91.86	9.75	<0.001
70 min	80.39	4.30	91.98	10.62	<0.001
80 min	78.73	3.67	91.48	9.80	<0.001
90 min	77.87	3.48	93.67	9.54	<0.001
100 min	76.86	3.08	91.38	9.71	<0.001

In our study at baseline the MAP in Group DB was 92.96±7.29 mmHg and in Group MB was 91.94±12.16 mmHg which was statistically not significant. At 5 min the MAP in Group DB was 93.72±7.39 mmHg and in Group MB was 95.44±13.33 mmHg which was statistically not significant. At 10 min the MAP in Group DB was 91.86±7.02 mmHg and in Group MB was 97.82±12.09 mmHg which was statistically not significant. At 20 min the MAP in Group DB was 89.78±6.35 mmHg and in Group MB was 91.32±13.55 mmHg which was statistically not significant. At 30 min mean MAP in Group DB was 88.00±6.13 mmHg and in Group MB was 90.24±11.96 mmHg which was statistically not significant. Thus from base line to 30 min intra- operatively the mean MAP was statistically not significant as the P value was not <0.05. But at 40 min mean MAP in Group DB was 85.52±5.22 mmHg and in Group MB was 89.06±10.35 mmHg which was statistically significant. AT 50 min mean MAP in Group DB was 84.56±5.35 mmHg and in Group MB was 89.50±9.14 mmHg which was statistically significant. At 60 min mean MAP in Group DB was 82.46±4.81 mmHg and in Group MB was 91.86±9.75 mmHg which was statistically significant. AT 70 min mean MAP in Group DB was 80.39±4.30 mmHg and in Group MB was 91.98±10.62 mmHg which was statistically significant. AT 80 min mean MAP in Group DB was 78.73±3.67 mmHg and in Group MB was 91.48±9.80 mmHg which was statistically significant. AT 90 min mean MAP in Group DB was 77.87±3.48 mmHg and in Group MB was 93.67±9.54 mmHg which was statistically significant. AT 100 min mean MAP in Group DB was 76.86±3.08 mmHg and in Group MB was 91.38±9.71 mmHg which was statistically significant. Thus from 50 min to 100 min the mean MAP was decreased in Group DB which was statistically significant as the P value was <0.001.

Table 13: Comparison of SPO_2 between two groups at various time interval

SPO2	Group DB		Group MB		P Value
	Mean	SD	Mean	SD	
Baseline	99.00	.20	99.08	.34	0.156
5 min	99.00	.35	99.02	.43	0.799
10 min	98.86	.35	98.80	.53	0.508
20 min	98.94	.37	98.94	.42	1.00
30 min	98.86	.50	98.84	.62	0.859
40 min	98.98	.38	99.00	.40	0.799
50 min	99.06	.37	99.04	.49	0.820
60 min	99.04	.41	98.98	.47	0.495
70 min	98.83	.38	98.96	.46	0.155
80 min	98.98	.26	98.95	.37	0.741
90 min	99.03	.18	98.97	.43	0.484
100 min	99.00	.00	99.06	.43	0.626

In our study throughout intra-operative period the mean SpO2 value was maintained above 98% in both the group. There was no statistical significance as theP value was not <0.05.

Table 14: Comparison of VSS between two groups at various time interval

	Group DB		Group MB		P Value
	Mean	SD	Mean	SD	
0HR	1.00	.00	1.00	.00	Not applicable
1HR	1.00	.00	1.00	.00	Not applicable
2HR	1.00	.00	1.00	.00	Not applicable
4HR	1.54	.50	2.34	.48	0.06
6HR	2.32	.59	4.10	.64	<0.001
12HR	4.00	.60	4.20	.57	0.05
24HR	3.10	.35	3.2	.40	0.091

In our study the VAS score of Group DB and Group MB was 1 from 0 HR to 2 HR, hence there was no statistical or clinical significance between the groups and at 4th HRVAS score was 1.54±0.5 in Group DB and 2.34±0.48 in Group MB which was statistically not significance. But at 6th HR the VAS in Group DB was 2.32±0.59 and in Group MB it was 4.10±0.64. Hence its P value was <0.001 which was statistically and clinically significant. Thus there was more rescue analgesic dose of infusion Paracetamol 1gm. was given after 6 HR in Group MB.

Table 15: Comparison of RSS between two groups at various time interval

	Group DB		Group MB		P Value
	Mean	SD	Mean	SD	
0HR	1.00	.00	1.00	.00	Not applicable
1HR	1.56	.50	1.00	.00	<0.001
2HR	2.50	.51	1.48	.50	<0.001
4HR	1.60	.49	1.40	.49	0.492
6HR	1.00	.00	1.00	.00	Not applicable
12HR	1.00	.00	1.00	.00	Not applicable
24HR	1.00	.00	1.00	.00	Not applicable

In our study RSS of Group DB and Group MB was 1. There was no statistical significance between both the groups. But at 1st HR the RSS in Group DB was 1.56±0.50 and in Group MB was 1.00±0.00 which was statistically significant. At 2nd HR RSS in Group DB was 2.50±0.51 and in Group MB was 1.48±0.50 which was statistically significant. Thus in 1st and 2nd HR the RSS was statistically and clinically significant in Group DB as the P value was <0.001. Then at 6th, 12th, 24th HR in both the Groups the RSS was 1.00±0.00 thus there was no statistical significance between the groups.

Discussion

A prospective double blind randomized control study entitled "comparison of magnesium sulphate and dexmedetomidine as an adjuvant to bupivacaine for supraclavicular brachial plexus block using nerve stimulator" was undertaken in Krishna. Rajendra Hospital attached to Mysore Medical College and Research Institute.

After informed consent 120 patients of both sex, aged between 20-60 years with ASA class I and II, being posted for elective upper limb orthopaedic surgeries (forearm and hand) were randomly grouped into two groups of 50 patients.

Group DB: received Bupivacaine 0.5% (29.5ml) +Dexmedetomidine 50µg (0.5 ml)

Group MB: received Bupivacaine 0.5% (29.5ml) + Magnesium sulphate 250mg (0.5 ml). Under aseptic precautions supraclavicular brachial plexus block was done using peri-vascular Nerve stimulator technique and various parameters were studied.

Hypothesis made before starting study

We hypothesised to know the efficacy of Dexmedetomidine versus MgSO4 on rapid onset and prolongation of both sensory and motor blockade as well as quality of block as adjuvant to LA bupivacaine.

Among various approaches of supraclavicular brachial plexus block the peri-vascular block is more effective and produces complete anaesthesia of distal arm, forearm, hands and fingers. Hence to avoid GA effects like polypharmacy, airway manipulation and post operative effects of endotracheal intubation are being avoided. We have used nerve stimulator which is more appropriate method of eliciting the nerve location and better block achievement with reduction in the concentration and volume of drug in compare to paresthesia technique[6].

Tripathi A et al. and Swami SS et al.[4] in their study used dexmedetomidine (1µg/kg) in SCBPB to compare its efficacy with clonidine and observed that Dexmedetomidine at dose of 1µg/kg prolongs the duration of sensory and motor block and provides better patient satisfaction without any side effects.

Kathuria S et al. conducted a study to evaluate the effect of dexmedetomidine as an adjuvant to ropivacaine in SCBPB, They used 50µg/kg of dexmedetomidine to 0.5% ropivacaine. The authors concluded that dexmedetomidine at 50 µg/kg dose fastened the onset of sensory and motor blocks and prolongs the duration of analgesia without causing any adverse effects[5].

Agarwal S et al. in their study to evaluate the effect of dexmedetomidine as an adjuvant to bupivacaine in SCBPB the dose used by them was 100µg/kg, they observed that dexmedetomidine fastened the onset of sensory and motor block and prolongs the duration of analgesia but was shown to cause excessive sedation and of bradycardia which required treatment (1 dose of atropine)[9].

Nallam S R et al. in their study compared the different doses of dexmedetomidine as an adjuvant to Levobupivacaine in SCBPB. They used 50µg and 100µg of dexmedetomidine for their study and they noted that higher dose of dexmedetomidine (100µg) resulted in faster onset of sensory and motor block and prolonged the duration of analgesia however there were increased incidences of side effects like bradycardia and excessive sedation which was statistically significant than the subjects who received dexmedetomidine 50µg[10].

Hence they concluded that 100µg of dexmedetomidine in BPB hastens the onset and prolongs the duration of analgesia but with higher incidence of side effects than with dexmedetomidine 50µg.

Hence in our study we chose the dose of dexmedetomidine as 50µg which was considered to be an effective and safe dose without many side effects.

Conclusion

The addition of Magnesium sulphate and Dexmedetomidine to Bupivacaine for Supraclavicular brachial plexus block produces significant early onset of sensory and motor blockade also prolonged the total duration of sensory and motor blockade without much side effects. In comparison to Magnesium sulphate addition of Dexmedetomidine has more prolongation of sensory and motor blockade, requiring less sedative drugs and better patient acceptance during post-operative period as an advantage.

Conflict of Interest: Nil

Source of support: Nil

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