Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 85.10

(e) ISSN Online: 2321-95 (p) ISSN Print: 2348-6805

Original Research

Infusion of Magnesium Sulphate during Epidural Anaesthesia Using 0.5% Bupivacaine: Hemodynamic Parameters and Side Effects

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ABSTRACT:
Prevention of decrease in mean arterial pressure of greater than 30% has some basis, but it is important to remember that these data were derived from severely hypertensive, presumably untreated patients. For normotensive and treated hypertensive patients, a wider undocumented margin of safety probably exists. Each patient was visited pre-operatively and the procedure explained and written informed consent was obtained. Complete blood count, blood grouping, blood sugar, bleeding time, clotting time, blood urea,serum creatinine, serum electrolytes(sodium, potassium, chloride), chest x-ray, ECG were done as institutional protocol. The minimum age of the patient was 18 years and the maximum age was 50 years.The mean age of the patients in Magnesium sulphate group is27.22±7.42 years and 26.57±5.75 years in Normal saline group.
Keywords: Epidural Anesthesia, Bupivacaine, Hemodynamic Parameters

Received: 16 April, 2021 Accepted: 22 May, 2021

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This article may be cited as: SB Lokesh, Kadaganchikar GC, M Geetha. Infusion of Magnesium Sulphate during Epidural Anaesthesia Using 0.5% Bupivacaine: Hemodynamic Parameters and Side Effects. J Adv Med Dent Scie Res 2021;9(6):140-145.

INTRODUCTION

The cardiovascular effects of neuraxial blocks are similar in some ways to the combined use of intravenous α1- and β-adrenergic blockers: decreased heart rate and arterial blood pressure. The sympathectomy that accompanies the techniques depends on the height of the block, with the sympathectomy typically described as extending for two to six dermatomes above the sensory level with spinal anaesthesia and at the same level with epidural anaesthesia.[1] This sympathectomy causes venous and arterial vasodilation, but because of the large amount of blood in the venous system (approximately 75% of the total volume of blood), the venodilation effect predominates as a result of the limited amount of smooth muscle in venules. After neuraxial block induced sympathectomy, if normal cardiac output is maintained, total peripheral resistance should decrease only 15% to 18% in normovolemic healthy patients, even with nearly total sympathectomy.[2] In elderly patients with cardiac disease, systemic vascular resistance may decrease almost 25% after spinal anaesthesia, whereas cardiac output decreases only 10%.The heart rate during a high neuraxial block typically decreases as a result of blockade of the cardioaccelerator fibers arising from T1 to T4. The heart rate may decrease because of a fall in right atrial filling, which decreases outflow from intrinsic chronotropic stretch receptors located in the right atrium and great veins. It appears that total-body oxygen consumption in patients undergoing spinal anaesthesia correlates with the extent of spinal anaesthesia, thus providing a margin of safety for organ perfusion unavailable with non-neuraxial techniques.[3,4]

Prevention of decrease in mean arterial pressure of greater than 30% has some basis, but it is important to remember that these data were derived from severely hypertensive, presumably untreated patients. For normotensive and treated hypertensive patients, a

wider undocumented margin of safety probably exists. After arterial blood pressure decreases to a level at which treatment is believed to be necessary, ephedrine, a mixed adrenergic agonist, provides more appropriate therapy for the non-cardiac circulatory sequelae of neuraxial block than a pure α-adrenergic agonist does, unless the patient has a specific and defined blood pressure requirement.

METHODOLOGY

Seventy patients aged between 18yrs and 60yrs of physical status ASA grade 1 and ASA grade 2 undergoing elective infra umbilical surgeries were included in the study after ethical clearance from the college ethical committee.

Each patient was visited pre-operatively and the procedure explained and written informed consent was obtained. Complete blood count, blood grouping, blood sugar, bleeding time, clotting time, blood urea,serum creatinine, serum electrolytes(sodium, potassium, chloride), chest x-ray, ECG were done as institutional protocol. All patients were pre-medicated with tablet alprazolam 0.5 mg overnight the day before surgery.

INCLUSION CRITERIA

1. Patients aged 18-60 yrs.
2. Patients posted for surgeries lasting for <3 hours under Epidural anaesthesia.
3. Patients with ASA (American society of anesthesiologists) grade 1 & 2

EXCLUSION CRITERIA

1. Patients refusing to participate in the study.
2. Patient with uncontrolled hypertension, diabetes, cardio-respiratory disorders, neuro-psychiatric disorders, hepatic or renal dysfunction, obesity (BMI >30), history of alcohol or drug abuse.
3. Patients with ASA grade 3 or more.

Each patient was randomly allocated to one of the two groups of 35 patients each.

Group MG- Patients were given MgSO4 50mg/kg in 100 ml NS in 10 minutes, followed by an infusion of MgSO4 10 mg/kg/hr in 100ml NS over 1 hour.

Group NS- Patients were given 100 ml NS in 10 minutes, followed by an infusion of 100ml NS over 1 hour.

All necessary equipments and drugs needed for administration of general anaesthesia and resuscitation were kept ready in order to manage failure of epidural and any complications.

Intravenous access to be obtained in the upper limb with an intravenous cannula-18G and iv fluid connected. Standard monitors, ECG, pulse oximeter, non invasive blood pressure, respiratory monitoring to be connected and basal parameter noted.

Patients were given MgSO4 50mg/kg in 100 ml NS in 10 minutes, followed by an infusion of MgSO4 10 mg/kg/hr in 100 ml (MG group) for 1 hour or Normal Saline in same volume and rate for 1 hour as used in MG group through an infusion pump (NS group). After initiating the infusion, Epidural Anaesthesia was given L1-L2 interspace using Loss Of Resistance technique to air in sitting position using midline approach with 18G Tuohy's needle. Epidural catheter threaded cephalad and Inj. 2% Ligno adrenaline 3 ml test dose given.Patients were made to lie down in the supine posture immediately after the epidural, keeping the table flat and activated with inj. Bupivacaine 0.5% 12 ml.Level of sensory block by pin prick method and motor block by modified Bromage score was assessed at every 2 mins following epidural injection and the time taken to achieve complete loss of sensations upto T10 level and complete motor block was noted. Surgery began after confirming the loss of pin prick sensation over T10 level. Oxygen at 2 L/min through face mask and fluid therapy was given to all patients.

Intraoperative parameters such as SBP, DBP, MAP, HR, Spo2, ECG were noted every 5 minutes till end of surgery. Postoperatively the parameters were noted immediately and then every 30 minutes till full sensory and motor recovery.Post operative block was assessed every 15 minutes and time taken for regression of sensory block to the level of L1 and recovery of motor block to able to perform partial knee bend(modified Bromage score 6) was noted. Pain at rest was assessed using Visual Analog Scale every 10 mins for 3 hours and every 15 mins for next 2 hours, every30 mins for next 3 hours. Rescue analgesia given when VAS score was more than 3. Period of analgesia that is, from time of Epidural Anaesthesia to the time of first rescue analgesia required and total requirement of analgesia in 24 hours was recorded. Both the observer of the parameters and the patient were unaware to the drug injected IV and in epidural space. The collected data was statistically analyzed by using student t test.

RESULTS

Table 1: Age distribution of patients studied

Age in years	Group MG	Group NS
<20	1(2.9%)	0(0%)
20-30	27(77.1%)	29(82.9%)
31-40	4(11.4%)	5(14.3%)
41-50	3(8.6%)	1(2.9%)
Mean ± SD	27.22±7.42	26.57±5.75

The minimum age of the patient was 18 years and the maximum age was 50 years.The mean age of the patients in Magnesium sulphate group is27.22±7.42 years and 26.57±5.75 years in Normal saline group.

Table 2: Weight (kg) distribution in two groups of patients studied

Weight (kg)	Group MG	Group NS
51-60	10(28.6%)	9(25.7%)
61-70	21(60%)	21(60%)
71-80	4(11.4%)	5(14.3%)
Total	35(100%)	35(100%)
Mean ± SD	65.54±5.25	65.57±5.16

Mean weight of the patients in group MG was 65.54±5.25 kg and in group NS was 65.57±5.16 kg.

Figure 1: Comparison of Heart rate (bpm) between two groups

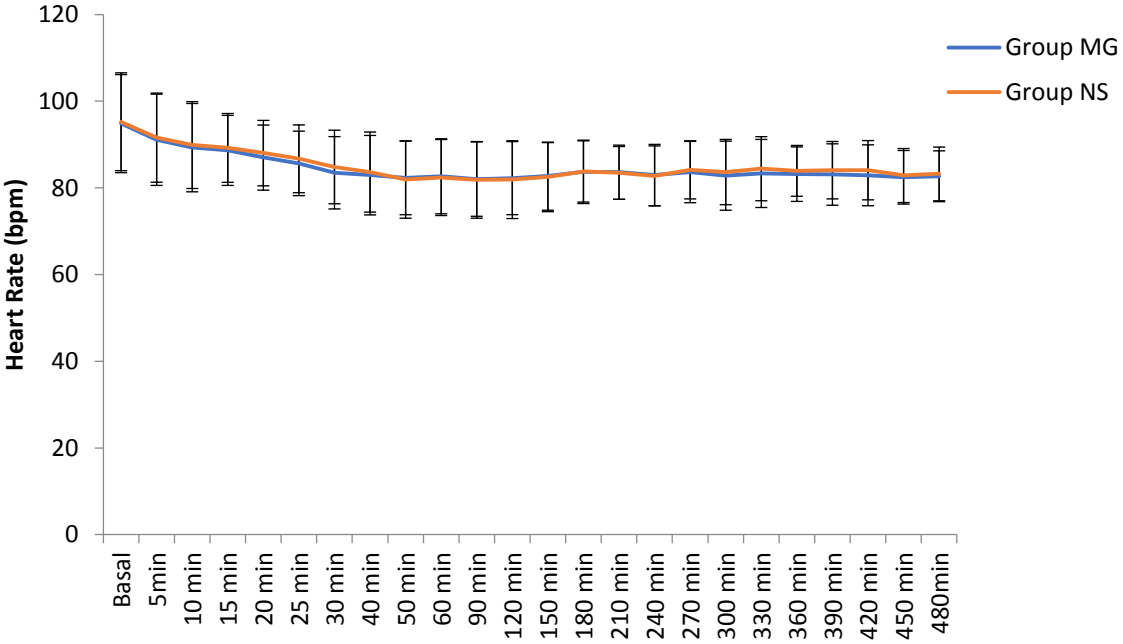

Figure 2: Comparison of SBP between two groups

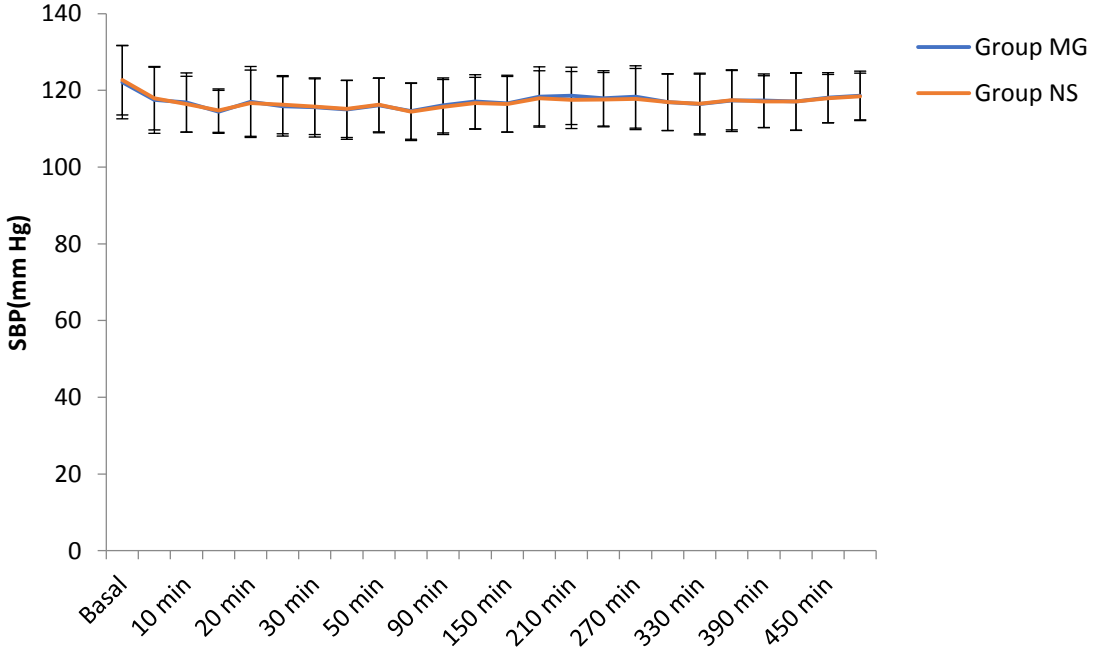

Figure 3: Comparison of DBP between two groups

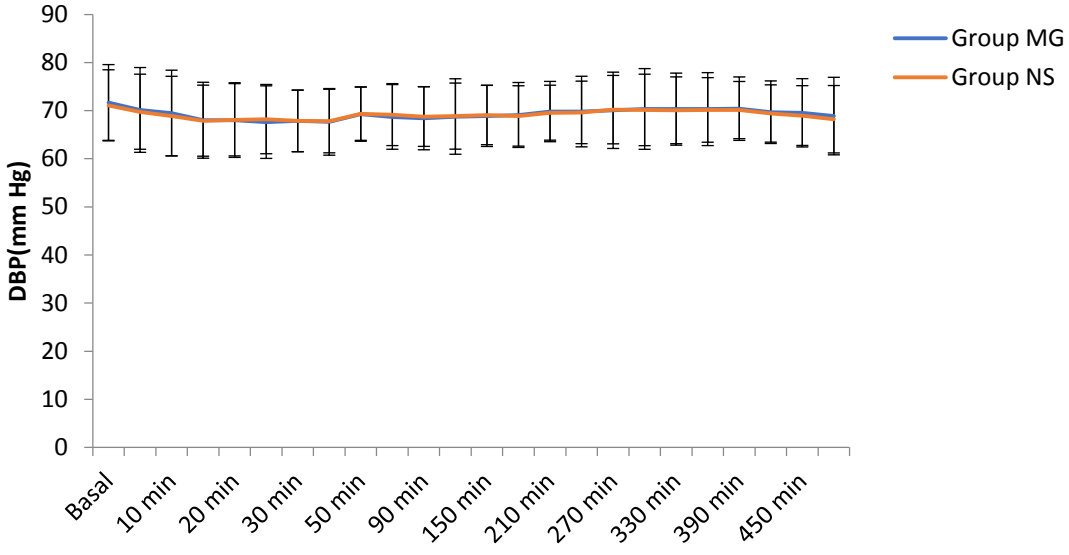

Figure 4: Comparison of MAP between two groups

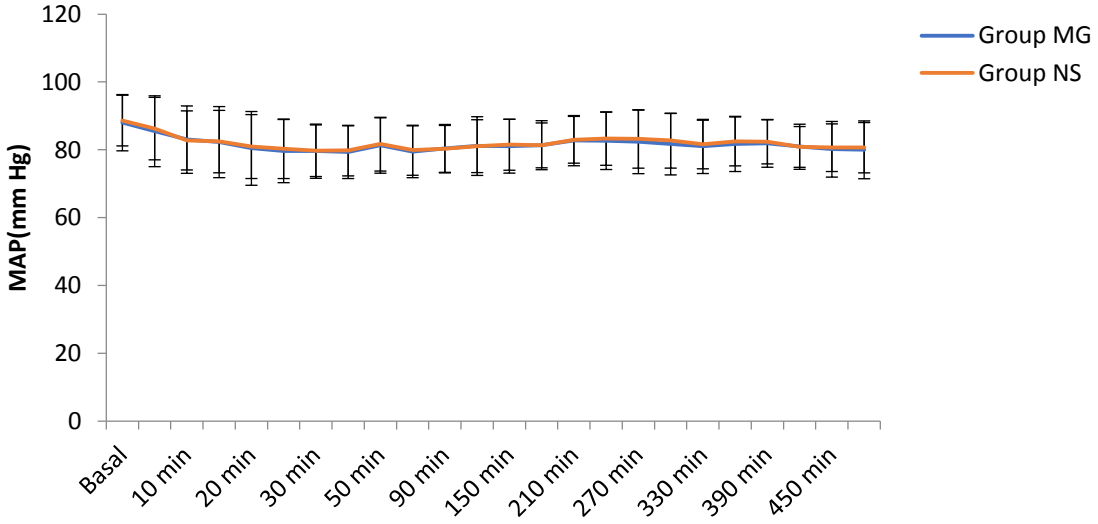

Figure 5: Comparison of SpO2 between two groups

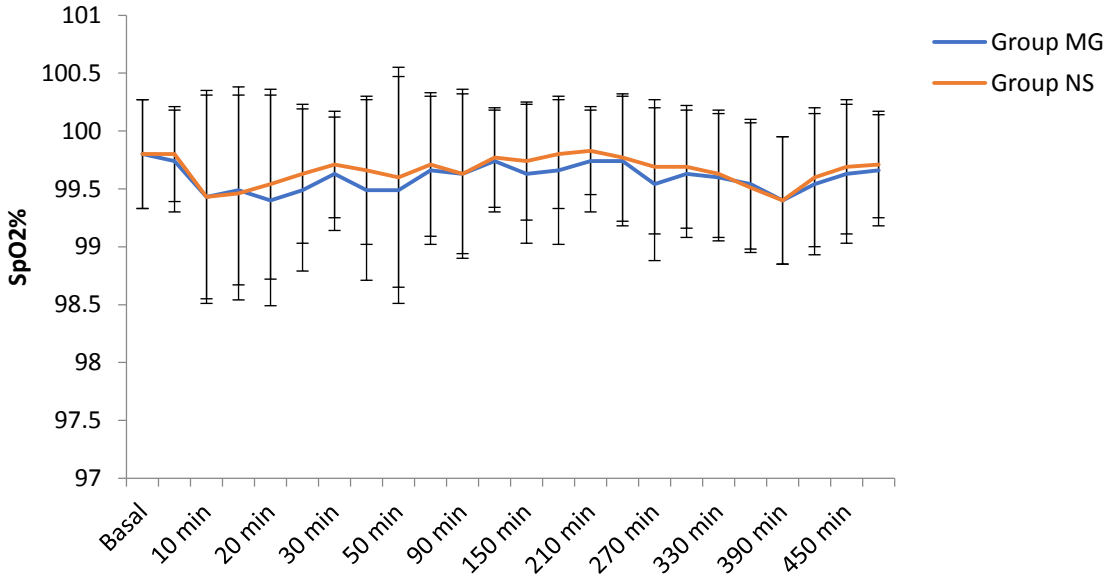

Table 3: Comparison of adverse effect between two groups

Any side effects	Group MG	Group NS	Total
Yes	0(0%)	0(0%)	0(0%)
No	35(100%)	35(100%)	70(100%)
Total	35(100%)	35(100%)	70(100%)

There was no incidence of any adverse effect i.e. bradycardia, hypotension, post operative nausea and vomiting in both the group.

DISCUSSION

There were no significant differences between the study groups with respect to changes in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure perioperatively.

Tramer MRet al, in 1996 found that Magnesium treated patients consumed less Morphine during the first 48 hours, which was most pronounced during first 6 hours and experienced less discomfort during the first and second post operative days. The Magnesium treated groups revealed no change in post operative sleeping patterns when compared to pre operative patterns. Control patients showed an increase in insomnia during the first and second post operative nights compared to pre operative values[5].

In 1998, Koinig H *et al*observed that post operative pain after hip replacement is usually described as moderate to severe, thus affecting patient outcome. The peri operative administration of MgSO4, either in single injection or as a continuous infusion, appears to be effective in reducing post operative pain and it is associated with minor consumption of analgesic drugs in the first 24 hours, without significant side effects[6].

Seong-Hoon Koet al, in 2001 conducted a study in 60 patients undergoing abdominal hysterectomy under general anaesthesia. The patients in the test group received 50 mg/kg intravenous magnesium sulphate as a bolus dose, followed by a continuous infusion of 15 mg/ kg/hr for 6 hours and the same volume of isotonic saline was administered to the control group. They observed that the cumulative analgesic consumption of analgesics were similar in both the groups in spite of higher serum magnesium levels in the test group. They concluded that perioperative intravenous magnesium administration may not be useful in providing post operative analgesia[7].

In 2003, Levaux CH *et al*studied the effect of intra operative MgSO4 on pain relief and patient comfort after major Lumbar Orthopedic Surgery concluded that 50 mg/kg bolus of MgSO4 given at the induction of anesthesia resulted in post operative opioid consumption, a better satisfaction score and a more satisfactory first night's sleep in patients undergoing major lumbar orthopedic surgery. It can be recommended as a useful adjunct for post operative analgesia[8].

A. Apan et al in 2004 in their prospective study done on 50 patients, found that the duration of rescue analgesia is increased and the total consumption of analgesics is reduced in the patients who received intravenous magnesium sulphate along with spinal anesthesia. In this study, 5 mg/kg bolus of magnesium sulphate followed by a 500 mg/hr infusion for 24 hours was administered. The conclusion of the study was, magnesium sulphate infusion may be used as an adjunct for reducing analgesic consumption after spinal anaesthesia[9].

In 2008, J.H. Ryu et al in their study which was conducted in 50 patients undergoing gynaecological surgery under total intravenous anaesthesia, administered a bolus dose of 50 mg/kg magnesium sulphate before induction and continued the infusion at the rate of 15mg/kg/hr till the end of the surgery. Postoperative pain scores, cumulative analgesic consumption, and shivering incidents were significantly lower in the test group compared to the control group [10].

CONCLUSION

There was no significant differences between the study groups with respect to changes in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure perioperatively.

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