Original Article

Effect of Lignocaine Alone & with $MgSO_4$ in Anesthesia

Comparison of Onset of Sensory Block with the Combination of Magnesium Sulphate and Lignocaine versus Lignocaine Alone in Hand and Forearm Surgeries under Intravenous Regional Anesthesia

Raza Farrukh[1], Salman Ather[2] and Hashim Imran[3]

ABSTRACT

Objective: To compare the mean time of onset of sensory block with the combination of magnesium sulphate and lignocaine versus lignocaine alone in hand and forearm surgeries under intravenous regional anesthesia.
Study Design: Randomized Controlled Trial study.
Place and Duration of Study: This study was conducted at the Department of Anaesthesiology, DHQ Teaching Hospital Sargodha and Department of Anaesthesiology, Jinnah Hospital Lahore from January 2016 to June 2016.
Materials and Methods: Following informed consent, 60 subjects fulfilling the inclusion criteria were selected for the study through non-probability purposive sampling. Subject was randomly assigned to two different anesthetic regimes by using random tables. The experimental group (M) was given lignocaine plus magnesium sulphate as an adjunct and control group (L) was given lignocaine alone for IVRA. The injection was given in 90 seconds by an anesthesiologist blinded to the drug and was to follow up the patient. The sensory block was evaluated every 30 seconds after injection of the drug using a standardized pin-prick technique with a 22-gauge short beveled needle, on a stop watch. The time of onset of complete sensory block in all the dermatomes were noted. The data was collected and analyzed in SPSS version 13.0. T-test was used to compare the mean time for the onset of sensory block in both groups. P-value ≤ 0.05 was significant.
Results: The mean age of the patients was noted as 37.97±9.52 years. The mean onset time of sensory block of the patients was noted as 6.58±2.61 minutes. The mean onset time of sensory block in MgSo4 group was noted as 4.13±0.79 minutes whereas the mean onset time of sensory block in Lignocaine group was noted as 9.03±0.94 minutes. Statistically there is highly significant difference between the study groups i.e. p-value=0.000*.
Conclusion: It was concluded from results of this study that addition of MgSO4 to lidocaine for intravenous regional anesthesia is beneficial. So in future we will recommend its use along with lidocaine for intravenous regional anesthesia.
Key Words: Magnesium Sulphate, Lignocaine, Regional Anesthesia,Sensory block nerve

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INTRODUCTION

Intravenous regional anesthesia (IVRA) is a simple, reliable, cost- effective and one of the safest forms of regional anesthesia, ideal for short procedures on upper extremity.[1] Its limitations include slow onset, tourniquet pain and minimal post-operative analgesia.[2]

[1.] Department of Anaesthesiology, District Headquarter Hospital Sargodha.
[2.] Department of Anaesthesiology, Jinnah Hospital Lahore.
[3.] Department of Anaesthesiology, Sargodha Medical College, University of Sargodha.

Correspondence: Dr. Raza Farrukh. Department of Anaesthesiology, District Headquarter Hospital Sargodha.
Contact No: 0333-4206478
Email: riz192@yahoo.com

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To improve block quality, post-operative analgesia and decrease tourniquet pain different additives have been combined with local anesthetics, with limited success.[3,4] Magnesium sulphate is one potential additive.[5]

The antinociceptive effect of magnesium include inhibition of calcium influx (calcium channel blocker) and antagonism of NMDA receptors.[6]

Use of magnesium sulphate has been shown to be successful in acute and chronic pain management, in reduction of peri-operative and post-operative pain and analgesic requirement, in spinal and epidural blocks to reduce anesthetic requirement, for peripheral nerve blocks providing prolongation of sensory and motor block and reducing intraoperative and postoperative analgesic requirement.However pain with injection of magnesium was the limitation of this technique,with similar results in other reports.[7]

As the duration of surgery is limited by the time during which tourniquet is safe (30-40 min),by decreasing the time of onset of sensory block, more time was available for the surgery and discomfort of proximal tourniquet for the patients was also less.[8,9] One of the studies reported sensory block onset time with lignocaine alone (6.20±2.35min) and statistically shorter (4.10±2.22min) compared to lignocaine with magnesium sulphate group ($p<0.05$).[10]

As magnesium sulphate is associated with decreased onset of sensory block, the purpose of this study is to evaluate the effect of magnesium sulphate when added as an adjuvant to lidocaine in IVRA for elective upper limb surgery in shortening the time of onset of sensory block which can allow us more time for the surgery and decreased discomfort to the patient due to proximal tourniquet.Many International studies are available but no local study on the aspect of shortening the onset of sensory block in IVRA is available.

MATERIALS AND METHODS

After approval from DHQ Teaching hospital Sargodha and Jinnah Hospital Lahore ethical committee and informed written consent 60 subjects fulfilling the inclusion criteria were selected for the study.Patients were randomly assigned to two different anesthetic regimes by using random tables. The experimental group (M) was given lignocaine plus magnesium sulphate as an adjunct and control group (L) was given lignocaine alone for IVRA. Mean arterial blood pressure (MAP), oxygen saturation (SpO_2) and heart rate (HR) were monitored.Before setting up the anesthetic block,two cannulas were placed; one was in the most peripheral vein on the dorsum of the operative hand and the other in the opposite hand. The operative arm was raised for 3 minutes, and then exsanguinated with an Esmarch bandage. Two pneumatic tourniquets were applied and the proximal cuff was inflated to 100 mmHg above systolic blood pressure. Circulatory isolation of the arm was confirmed by inspection, lack of radial pulse, and failure of pulse oximetry tracing of the ipsilateral index finger. IVRA was accomplished using 20 ml lignocaine 1% diluted with 20 ml saline to a total of 40ml in group L (n=30) or 7.5 ml magnesium sulphate 20% plus 20ml lignocaine 1% diluted with 12.5ml saline to a total of 40ml in group M (n=30). The injection was given in 90 seconds by an anesthesiologist blinded to the drug and followed up the patient. The sensory block was evaluated every 30 seconds after injection of the drug using a standardized pin-prick technique with a 22-gauge short beveled needle, on a stop watch. The patient's response was evaluated in the dermatomal sensory distribution of the medial and lateral ante-brachial cutaneous, ulnar, median and radial nerves. The time of onset of complete sensory block in all the dermatomes were noted. Intravenous analgesics were not given to avoid confounding factors.

Subsequent to accomplishment of sensory and motor blocks, surgery was allowed to start.MAP, HR and SpO_2 were monitored before and after tourniquet use, at every 2 minutes after the beginning of anesthesia. All this procedure was done by researcher himself. All the relevant data was recorded on prescribed Proforma (attached).

Data Analysis: The data was collected and analyzed in SPSS version 13.0. Quantitative variables like age, sensory block onset time were measured in the form of mean±SD. Qualitative variables like gender was measured in the form of frequency and percentage. T-test was used to compare the mean time for the onset of sensory block in both groups. P-value $\leq$ 0.05 was significant.

RESULTS

The mean age of the patients was noted as 37.97±9.52 years with minimum and maximum ages of 20 and 59 years respectively. In this study 66.67% cases were males whereas 33.33% cases were females. Out of 60 patients 40 were males in which 24 were from MgSo4 group and 16 were from Lignocaine group, similarly 20 patients were females in which 6 were from MgSo4 group and 14 were from Lignocaine group.

The mean onset time of sensory block of the patients was noted as 6.58±2.61 minutes with minimum and maximum values of 2.45 and 10.55 minutes respectively.

The mean onset time of sensory block in MgSo4 group was notes as 4.13±0.79 minutes whereas the mean onset time of sensory block in Lignocaine group was noted as 9.03±0.94 minutes. Statistically there is highly significant difference between the study groups i.e. p-value=0.000*.Table 1.

Among male patients, the mean onset time of sensory block in MgSo4 group was 4.200.66minutes whereas the mean onset time of sensory block in Lignocaine group was noted as 9.220.84minutes.Males in MgSO4 group has significantly less onset time as compared to Lidocaine group i.e. p-value=0.000*.Among female patients, the mean onset time of sensory block in MgSo4 group was 3.861.26 minutes whereas the mean onset time of sensory block in Lignocaine group was noted as 8.811.05 minutes. Females in MgSO4 group has significantly less onset time as compared to Lidocaine group i.e. p-value=0.000*.Table 2.

In MgSO4 group, the mean onset time of sensory block in in males was 4.200.66minutes whereas in females was 3.861.26minutes. There was insignificant difference observed between both genders for mean onset of sensory block i.e. p-value = 0.174. In Lidocaine group, the mean onset time of sensory block in in males was 9.22±0.84minutes whereas in females was 8.81±1.05minutes. There was insignificant

difference observed between both genders for mean onset of sensory block i.e. p-value = 0.107. Table 3.

Table No.1: Descriptive statistics of onset time of sensory block with respect to study groups

Onset Time (minutes)	Study Groups	
	$MgS0_4$	Lignocaine
n	30	30
Mean	4.13	9.03
SD	0.79	0.94

p-value= 0.000 (Significant)

Table No.2: Descriptive statistics of onset time of sensory block in both gender with respect to study groups

		Study Groups		p-value	Significance
		$MgS0_4$	Lignocaine		
Onset Time (minutes)	Male	4.200.66	9.220.84	0.000	Significant
	Female	3.861.26	8.811.05	0.000	Significant

Table No.3: Descriptive statistics of onset time of sensory block in both study groups with respect to gender

		Study Groups		p-value	Significance
		Male	Female		
Onset Time (minutes)	$MgS0_4$	4.20± 0.66	3.86± 1.26	0.174	Insignificant
	Ligno-caine	9.22± 0.84	8.81± 1.05	0.107	Insignificant

DISCUSSION

Intravenous Regional Anaesthesia (IVRA) is a simple and effective technique for upper limb distal surgery. Regional analgesia has been introduced as better analgesic technique compared to using systemic analgesic agents, and it may decrease the adverse effects of them and increase the degree of satisfaction. The use of intravenous regional anesthesia (IVRA) was first described by Karl August Bier in Berlin, Germany in 1908, hence its name, Bier's Block. The block is simple to perform often by non-anesthesiologist, effective and cheap.[11]

The use of magnesium as an adjuvant in perioperative analgesia is unique. Intravenous regional anesthesia (IVRA) is one of the safest and most consistent modes of regional anesthesia for short procedures on upper extremity.[12]

Our study showed that adding magnesium to lidocaine for IVRA enhances the speed of onset and the quality of anesthesia. Various adjuncts have been used with lignocaine to decrease tourniquet pain and prolong post-operative analgesia during intravenous regional anesthesia . Calcium-channel blockers potentiate the analgesic effect of local anesthetics.[13]

Our study results showed that the mean onset time of sensory block in MgSo4 group was noted as 4.13±0.79 minutes whereas the mean onset time of sensory block in Lignocaine group was noted as 9.03±0.94 minutes. Statistically there is highly significant difference between the study groups i.e. p-value=0.000*. Tramer and Glynn used magnesium for the treatment of chronic limb pain in IVRA and showed that the addition of magnesium to lidocaine increases the quality of the block, lengthens the analgesia and decreases the overall failure rate.[14]

Narang S et al., concluded that magnesium sulphate added as an adjuvant to lignocaine hastens the onset of sensory and motor block and decreases tourniquet pain. They assessed in their study that the response to injection of drug; sensory and motor block and tourniquet pain. The mean time of onset of sensory block was 12.40 and 3.47 minutes in groups L and M respectively ($P < 0.001$). The average times of onset of motor block in groups L and M were 17 and six minutes respectively ($P < 0.001$).[15] Reuben et al., showed that the addition of magnesium to lidocain for IVRA improves the speed of onset and quality of analgesia.[16]

ParvizKashefi et al., concluded that adding magnesium to lidocaine in IVRA demonstrated reduced intraoperative fantanyl use and pain associated with the tourniquet. It also shortened sensory and motor block onset times and made better the quality of anesthesia while prolonged the time to the first postoperative analgesic requirement.(10) Turan and his coworkers used magnesium for decreased pain associated with injection of rocuronium.(17)

A Puttappa et al concluded that using the combination the dose of lignocaine for IVRA can be reduced to a non-toxic level for the same quality of analgesia and at the same time not offer any post analgesic benefit as all study patients were required supplement of analgesics post operatively after about 50-60 minutes.(18)

One of the studies reported sensory block onset time with lignocaine alone (6.20±2.35min) and statistically shorter (4.10±2.22min) compared to lignocaine with magnesium sulphate group ($p<0.05$).(19)

The duration of surgery is limited by the time during which tourniquet is safe (30-40 min) by decreasing the time of onset of sensory block, more time will be available for the surgery and discomfort of proximal tourniquet for the patient will also be less.(8)

The present study showed that the mean onset time of sensory block of the patients was noted as 6.58±2.61 minutes. Michael F et al showed that for most outpatient surgical procedures, the use of 1.5% lidocaine or mepivacaine provide adequate surgical anesthesia and analgesia for 4 to 6 hours.(20)

Studies have shown that time to two dermatome regression for 50 mg and 75 mg doses of hyperbaric 5% lidocaine are 50 ± 16 and 75 ± 4 minutes, respectively, and resolution of sensory block 123 ± 21 and 136 ± 6 minutes, respectively.(21)

In our study, we stratified data for gender and compared mean onset of sensory block between male and female

patients. In MgSO4 group, the mean onset time of sensory block in males was 4.200.66 minutes whereas in females was 3.861.26 minutes. In Lidocaine group same pattern was observed. The mean onset time of sensory block in males was 9.22±0.84 minutes whereas in females was 8.81±1.05 minutes. There was insignificant difference observed between both genders for mean onset of sensory block i.e. p-value >0.05. But it was observed that male patients require more time for onset of sensory block as compared to females.

CONCLUSION

It was concluded from results of this study that addition of MgSO4 to lidocaine for regional anesthesia is beneficial. So in future we will recommend its use along with lidocaine for regional anesthesias magnesium sulphate is associated with decreased onset of sensory block as it has been proved through our study.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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