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Effect of Intravenous Infusion of Magnesium Sulphate during Spinal Anesthesia for Inguinal Hernia Repair on Post Operative Analgesia

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Abstract

Abstract Background and aims: IV magnesium sulphate can prolong the effect of spinal anesthesia.

The aim is to compare the effect of IV magnesium sulphate during spinal anaesthesia on post-operative pain and regression of motor blockade.

Methods: Sample size of 39 in each group. Patients were randomly allocated to two groups. Patients in group M received Inj.MgSO4 50 mg/kg for 15 minutes after spinal anesthesia followed by 15 mg/kg till surgery ends and Group S received same volume of normal saline over same period and observed for time for first analgesia and regression of motor-blockade.

Result: Time from spinal anesthesia to first analgesia requirement in Group M was pronged (15.3±2.79). Regression of motor-blockade is delayed in Group M (7.16±1.34). Increase in serum-Magnesium concentration immediately (91.82±0.137), 1 hour (1.90±0.08), 24 hours after surgery (1.80 ±0.07) in Group M.

Conclusion: Time for the first t analgesia was prolonged in Group M, and regression of motor blockade was slower in Group M.

Keywords: Spinal Anaesthesia, Magnesium Sulphate, Post-Operative Pain

Introduction

Adequate post-operative pain management is essential for early rehabilitation and recovery. MgSO4 acts as an antagonist in N-methyl -D-aspartate receptors (NMDA) and calcium channel blocker. It is presumed that antagonism at NMDA receptor is responsible for the prevention of induction of central sensitization due to peripheral nociceptive stimulations and abolishes hypersensitivity, although the exact mechanism by which systemic magnesium sulphate producing post operative analgesia is not known.

Aim

The aim of this study is to

1. To compare the effect of intravenous infusion of magnesium sulphate during spinal anaesthesia on post operative pain and analgesic consumption.
2. To compare the regression of motor blockade during the post-operative period

Methodology

Observational study

Random sampling of 78 study participants using the formula

$$n = \frac{2s_p^2 [z_{1-\alpha/2} + z_{1-\beta}]^2}{\mu^2_d}$$

$$s^2_p = \frac{s_1^2 + s_2^2}{2}$$

Study setting: Sree Gokulam Medical College and Research foundation

Inclusion Criteria

- ASA 1 and 2
- Patient age group between 18 and 60
- Patient posted for unilateral inguinal hernia repair under spinal anesthesia
- Patients are heighted between 155-175 cm

Exclusion Criteria

- ASA 3 and 4 patients
- Contraindications for spinal anesthesia
- Patients having height less than 155 cm and more than 170 cm
- Obese with BMI more than or equal to 30

Study Procedure

Patients were educated about the purpose of the study, and visual analogue score for pain analysis during the preoperative visit. Informed written consent was obtained from all patients included in the study.

Patients were shifted to operating room and standard monitors non-invasive blood pressure (NIBP) monitoring, pulse oximetry and ECG attached, and baseline readings are noted. Patients are premedicated with Inj. MIDAZOLAM 0.03 mg IV. Coloaded with iv fluid, normal saline. Patient placed in right lateral decubitus position for spinal anesthesia. Under strict aseptic precautions, local infiltration at L3-L4 space with Inj.2% LIGNOCAINE 2 cc, lumbar puncture done at L3-L4 space with 25 G quincke babcock spinal needle and hyperbaric BUPIVACAINE 0.5% 3.2 ml with 60 mcg of Inj. BUPRENORPHINE as addictive given intrathecally using a 5cc syringe.

Patients were randomly allocated to two groups. Patients in magnesium group (group M, n=39) were provided with Inj. MgSO4 50 mg per kg for 15 minutes after spinal anesthesia followed by 15 mg per kg for the duration of surgery. Patients in saline group (Group S, n =39) were provided with the same volume of normal saline over same period of time. The height of spinal block was evaluated for cold sensation every 3 minutes

for 20 minutes. Inj ephedrine was used to treat hypotension (more than 20% fall from baseline BP) and Inj. Atropine was used to treat the bradycardia (Heart rate less than 45 beats per minute).

In the post anesthesia care unit, regression of motor blockade was assessed using modified Bromage scale. Time from onset of spinal anesthesia to attainment of grade 0 modified Bromage scale is recorded as the time for regression of motor blockade.

0-100 mm VAS score was used to evaluate the post-operative pain. (0- no pain and 100 – worst pain). Blood samples for evaluating the serum magnesium levels were sent immediately after surgery, 1 hour and 24 hours after surgery and documented.

Observation and Result

Age Distribution

Table 1: Age distribution (N=78).

Age in years	Group M Frequency (%)	Group S Frequency (%)
18-30	20 (51.28)	18 (46.15)
31-60	19 (48.72)	21 (53.85)

Groups for both Group M and Group S. In group M 51.28% participants belong to the age group of 18-30 and 48.72 % belong to the age group of 31-60 years. In group S, 46.15 % participants are in 18-30 years age group category and 53.85 % in 31-60 years age group category.

ASA Physical Status Distribution

Table 2: ASA physical status distribution (N=78)

ASA	GROUP M Frequency (%)	GROUP S Frequency (%)
ASA I	24 (61.53)	19 (48.71)
ASA II	15 (38.46)	20 (51.28)
Total	39 (100)	39 (100)

Table 2 shows the ASA physical status distribution between study participants (N=78), in group M ,61.53% of participants are ASA I and 38.46% are in ASA II category. In group S 48.71% participants were ASA I and 51.28 % were ASA II.

Gender Distribution

Table 3: Gender distribution among study participants (N=78)

GENDER	GROUP M	GROUP S
	Frequency (%)	Frequency (%)
MALE	24(61.53)	18(46.15)
FEMALE	15(38.46)	21(53.84)
TOTAL	39(100)	39(100)

Table 3 shows gender distribution of study participants, of which 61.53 % of are Male and 38.46 % are female in Group M (n=39) whereas in group S(n=39), 46.15 5 are male and 53.84 % are females.

Height Distribution among Study Participants (N=78)

Table 4: Height distribution among study participants (N=78)

Group	Height (centimeters)	p-value
Group M	166.97± 5.35	0.4638
Group S	166.05±5.68	

Table 4 shows the height distribution among the study participants is relatively equal in both group M (166±5.53) and in group S (166.05±5.68) and the p-value of 0.4638 shows no statistical significance in distribution of height among the study participants.

Duration of Surgery

Table 5: Duration of surgery

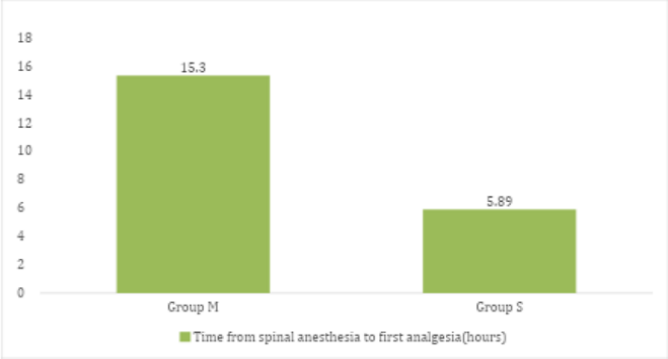
Group	Duration of surgery (hours)	p-value
Group M	81.25±16.83	0.813
Group S	82.43±22.05	

Table 5 shows the duration of surgery among the two groups with group M having 81.25±16.83 hours and Group S having 82.43±22.05 hours and a p-value of 0.813 shows that there is no statistical difference between the two groups

Time from Spinal Anaesthesia to First Analgesia

Table 6: time from spinal anaesthesia to first analgesia

Group	Time from spinal anesthesia to first analgesia (hours)	p-value
Group M	15.30±2.79	<0.0001
Group S	5.89±3.12	



Graph 1: time from spinal anaesthesia to first analgesia

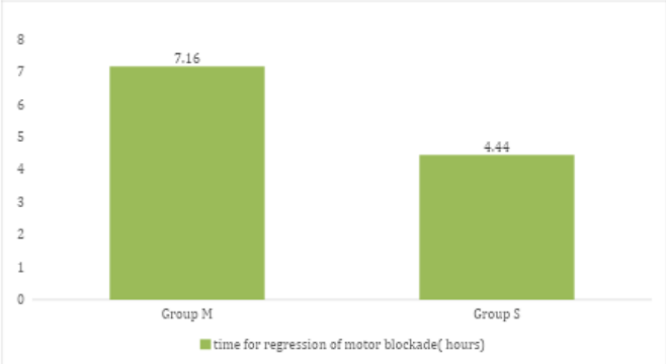
Table 6 shows the time from spinal anaesthesia to first analgesia requirement, group M was pronged duration(15.3 ± 2.79) than group S (5.89±3.12) with a p-value of <0.0001 and is statistically significant.

Regression of Motor Blockade

Table 7: Regression of motor blockade (N=78)

Group	Time for regression of motor blockade	p-value
Group M	7.16 ±1.32	<0.0001
Group S	4.44 ±0.70	

Table 7 shows the regression of motor blockade is delayed in group M (7.16±1.34) than in Group S (4.44±0.70), with a p-value of < 0.0001 shows a significant statistical difference between the two groups.



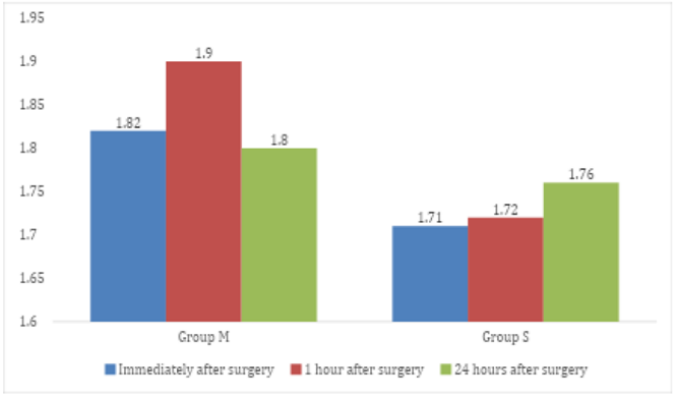
Graph 2: Regression of motor blockade

Serum Magnesium Concentration

Table 8: Serum Magnesium concentration

Serum magnesium level	Group M	Group S	p-value
Immediately after surgery	1.82±0.137	1.71±0.08	<0.0001
1 hour after sugery	1.90±0.08	1.72±0.07	<0.0001
24 hours after surgery	1.80 ±0.07	1.76±0.07	0.0137

Table 8 shows the distribution of serum Magnesium concentration among the study participants. There is an increase in serum Magnesium concentration immediate after surgery (1.82± 0.137), 1 hour after surgery (1.90±0.08) and 24 hours after surgery (1.80 ±0.07)in group M compared to group S with a p value less than 0.0001 immediately after surgery and 1 hour after surgery and 0.0137 24 hours after surgery shows a statistically significant difference between the two groups.



Graph 3: distribution of serum magnesium concentration

Discussion

The study showed that IV magnesium sulphate infusion under spinal anaesthesia for unilateral inguinal hernia repair has prolonged duration of anaesthesia and reduced post operative pain. Unilateral hernia repair is usually associated with mild to moderate pain and are manageable with NSAIDS and opioids.

The analgesic effect of magnesium sulphate is unclear, but was presumed to be due to NMDA receptor antagonism, which prevents central sensitization to peripheral nociceptive stimulation and thus abolishing hypersensitivity. Post operative pain was reduced in patients received IV magnesium sulphate and thus reduced requirement of analgesics.

the time from spinal anaesthesia to first analgesia requirement group M is pronged in (15.3 ± 2.79) than

group S (5.89±3.12) and also the regression of motor blockade to Modified Bromage scale 0 was found to be slower in Group M (7.16±1.34) than in Group S (4.44±0.70), with a p-value of < 0.0001 shows a significant statistical difference between the two groups.

After surgery, serum magnesium level was increased in group M, but was not associated any side effects as the increased level was within normal limits. In this study the average increase in serum magnesium concentration was (1.82± 0.137, 1.90±0.08, 1.80± 0.07) immediately after surgery, 1 hour after surgery and 24 hours after surgery. Group S has normal serum magnesium level in the post-operative period.

Conclusion

The study concludes that there was no statistical difference among the study participants in terms of Gender, Height, ASA physical status or age group. There was significant differences in the time for the first analgesic request by the patient after spinal anesthesia in group M compared to group S, which was prolonged in Group M. Also, the regression of motor blockade was slower in Group M than in group S. the serum magnesium level was higher in group M immediately after surgery, 1 hour after surgery and 24 hours after surgery.

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