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EFFICACY OF INTRAVENOUS INFUSION OF MAGNESIUM SULPHATE IN OPIOID FREE BALANCED GENERAL ANAESTHESIA

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ABSTRACT **Background And Methods:** The aim of this study is to study efficacy of iv infusion of mgso4 in opioid free balance general anaesthesia. All ASAI patients after going pre-anaesthetic checkups will be taken in operation theater. Prior to induction routine monitoring of pulse oximetry, Bloodpressure , ecg should be commenced and iv line with 18 gauze cannuala should be secured. The serum magnesium level should be measured pre and post operatively .Intraoperatively the dose of propofol and muscle relaxant was noted down .Other parameters were also checked in the recovery unit like deep tendon reflex , sedation score, post-operative nausea and vomiting, shivering and the total numbers of analgesia in 24 hrs. **Results:** On the basis of our 20 samples , We have found reduction in induction dose of propofol and total dose of muscle relaxant used throughout the surgery. we have also found significant reduction in the post-operative analgesic requirement in the first 24 hrs and lesser incidence of post-operative nausea and vomiting in 70% of our patients. **Conclusion:** Through our study we concluded that use of intravenous infusion of magnesium sulphate allows us to provide opioid free general anaesthesia and its related side effects .It also reduces the dose of anaesthetic agents , provides good hemodynamic stability without any adverse effects as well as it is cost effective .

KEYWORDS : Infusion, Mgso4, Opioid & Anaesthesia.

INTRODUCTION

Opioid free anaesthesia is a combination of various opioid sparing techniques leading to no administration of intraoperative, systemic, neuroaxial or intracavitory opioids. This attempts to prevent opioid induced side effects like respiratory depression, bradycardia, urinary retention, vomiting, itching, addiction & develop anti-hyperalgesic techniques to improve post-operative pain control.

Balanced general anaesthesia, is a triad of hypnosis, analgesia & areflexia. Balanced anaesthesia gives advantage of drug's beneficial effect while minimizing each agent's adverse quality. Magnesium is the fourth most abundant cation in the body and the second most abundant intracellular cation .It activates many enzymes system involved in energy metabolism and act as natural calcium channel blocker .it has the potential to treat and prevent the pain by inhibiting NMDA receptor. Magnesium is required for protein synthesis, DNA & RNA synthesis, reproduction. It also regulates muscular contractions, cardiac excitability, blood pressure, vasomotor tone, insulin metabolism , nerve transmission & neuro muscular conduction.

Magnesium also decreases the amount of acetlycholine release from motor nerve terminal & leads to diminished excitability of muscle fibre & reduction in amplitude of end plate potential. Hence it potentiates the neuro muscular blockade produced by non depolarizing neuro muscular blocking agents. It also decreases catecholamine release from adrenal medulla and adrenergic nerve endings. Therefore reduces stress response to laryngoscopy and intubation & post operative shivering.

Magnesium has been extensively used prophylactically for terminating seizures in eclamptic patients. It has also been used in treatment of ventricular arrthymias associated with epinephrine, digitalis, and bupivacaine administration.

The present trial aimed to evaluate the effectiveness of magnesium sulfate as an alternative for intraoperative analgesia, compared to the use of fentanyl. The hypothesis was that magnesium sulfate could provide satisfactory intraoperative analgesia.

AIM:

To study the efficacy of intravenous magnesium sulphate in elective surgeries under general anaesthesia.

OBJECTIVES:

Primary:

1. To maintain opioid free intra-operative analgesia.
2. To reduce the dose of propofol and muscle relaxant .

Secondary:

1. To maintain post-operative analgesia.
2. To decrease the incidence of post-operative nausea and vomiting.

MATERIAL &METHODS:

This interventional study conducted in Department of Anaesthesiology, Index Medical College & Research Centre, Indore, Madhya Pradesh was conducted following approval by hospital ethics committee and after obtaining written informed consent from patients. A total of 40 ASA I patients between age 20 to 50 years undergoing elective surgeries under general anesthesia were selected and divided into two groups A and B each of 20 patients and serum magnesium levels was sent .

Exclusion Criteriae :

Patient refusal, allergy to study drug, patient having severe cardiac, pulmonary, hepatic, renal disease, pregnant and lactating women were excluded from the study .

Procedure:

All 40 patients after under going pre-anaesthetic checkups fitness and informed consent will be taken in operation theater. Prior to induction ,injection glycopyrolate 0.2mg were given to all patients in the pre-operative room. In operation theatre, monitors were connected to all patients - pulse oximetry, Blood pressure, Electrocardiogram , etco2 and iv line of 18 gauze was secured.

Group-A

Patients received infusion of mgso4 at the rate of 30mg/kg /hr over 10 min before induction of anaesthesia .After this pre-oxygenation with 100%oxygen was done and 1 mg midazolam was given to the patient .

Group-B

Started with pre-oxygenation with 100%oxygen , 1 mg midazolam was given to the patient with 2mcg/kg fentanyl.

Then in both the groups propofol was started ,loss of spontaneous ventilation was taken as anesthetic end point. After all this, patient was intubated by giving inj succinycholine(1.5mg/kg) Bilateral air entry

was checked and endotracheal tube was fixed. Muscle relaxant vecuronium 0.1mg/kg as loading dose was given and 0.01mg/kg vecuronium was used as maintenance dose throughout surgeries and Sevoflurane was kept @1.5% .

Now in group-A as maintenance mgso4 @10 mg/kg/hr was started. The infusion of mgso4 was stopped 30 mins prior to reversal.

After completion of surgical procedure sevoflurane was gradually tapered and stopped. After watching for spontaneous respiratory efforts, patient was reversed as per protocol, with neostigmine and glycopyrolate and was extubated after extubation criteria was met. patient was monitored for vitals, deep tendon reflex, signs of hypermagnesemia, post-operative sedation, shivering, pain score was noted. Also doses of propofol, and muscle relaxants were noted down. Patient was followed for the next 24hrs for number of analgesic requirement .

RESULTS :

Table 1 .Age and weight distribution with duration of surgery

	GROUP A	GROUP B	P VALUE
Mean age	33.70 ± 9.25	39.60 ± 9.81	0.183, NS
Mean weight	51.80 ± 6.30	50.80 ± 7.87	0.757, NS
Mean duration of surgery	165.00 ± 14.14	166.00 ± 15.78	0.883, NS

Table No. 2 Comparison of induction dose of propofol (mg) between the two groups (N=20)

Group	No.	Mean ± SD	't' value, df	P value
Group-A	20	94.00 ± 8.43	3.841, df=18	0.001*
Group-B	20	115.00 ± 15.09		

Unpaired 't' test applied. P value = 0.001, Significant

Table No. 3 Comparison of total dose of muscle relaxant (mg) between the two groups (N=20)

Group	No.	Mean ± SD	't' value, df	P value
Group-A	20	8.10 ± 0.74	-5.955, df=18	0.001*
Group-B	20	10.80 ± 1.23		

Unpaired 't' test applied. P value = 0.001, Significant

Table No. 4 Comparison of total number of analgesics requirement in first 24 hours at different time intervals between the two groups (N=20)

Parameter	Group	No.	Mean Rank	Sum of Rank	Mann-Whitney U test	P value
Total number of analgesics requirement in first 24 hours	Group -A	20	6.75	67.50	12.500	0.002 *
	Group -B	20	14.25	142.50		

Mann-Whitney U test applied. P value <0.05 was taken as statistically significant

Table 5 Comparison of pain at different time intervals between the two groups (N=20)

Time Point	Group	No.	Mean Rank	Sum of Rank	Mann Whitney U test	P value
0 Min	Group-A	20	8.50	85.00	30.000	0.030*
	Group-B	20	12.50	125.00		
60 Min	Group-A	20	7.50	75.00	20.000	0.005*
	Group-B	20	13.50	135.00		
120 Min	Group-A	20	10.50	105.00	50.000	1.000, NS
	Group-B	20	10.50	105.00		
180 Min	Group-A	20	14.50	145.00	10.000	0.001*
	Group-B	20	6.50	65.00		
240 Min	Group-A	20	11.50	115.00	40.000	0.146, NS
	Group-B	20	9.50	95.00		

Mann-Whitney U test applied. P value <0.05 was taken as statistically significant

DISCUSSION:

Post –operative pain is one of most important issues that could hinder post-operative peace and comfort .The major goal in post-operative management is to minimize the dose of medications with lesser side effects and still leading to adequate post-operative analgesia. Therefore we came across drug called magnesium sulphate which has been reported to be effective in perioperative pain treatment and in blunting somatic ,autonomic and endocrine reflexes provoked by noxious stimuli .It also has been reported that intraoperatively it reduced the requirement for anaesthetics and muscle relaxants .

In our study we had included 40 patients ,20 in each group. Group –A received magnesium sulphate before induction and as in maintenance, whereas in group-2 fentanyl was given to patients .

The majority of patients in both groups were in the age range 20-55years .The mean age in the group-A was 33.70+/- 9.25 and in group-B was 39.60+/-9.81. There was no statistically significant difference between the two groups (Pvalue 0.183).Age wise both groups were comparable .

In groupA,there were 8(40%)females and 12(60%)males,while in group B, there were10(50%)females and 10(50%)males.In group A,males were slightly more than the females.There was no significant association between the sex and the group(Pvalue 0.653).Both groups were comparable with respect the sex of the patient .

In our study all patients are ASA I. The mean weight in group A was 51.80+/-6.30 whereas in group B was 50.80+/-7.87 which was found statistically non significant pvalue 0.757

The mean duration of surgery in group A was165+/-14.14 and in group B was 166+/-15.78 .Statistically there was no significant difference between the two groups (Pvalue 0.883).The mean duration of surgery was comparable between the two groups .

The mean induction dose of propofol in group A was 94+/-8.43 and in group B was 115+/-15.09 The mean difference in propofol requirement was found to be statistically significant (Pvalue0.001). The mean propofol requirement was slightly higher in group B as compared with group A. Similar findings were seen in a study conducted by **K.Gupta etal** ,lower doses was seen in magnesium sulphate group . In a study conducted by **J.E Vieira etal** consumption of propofol more in magnesium group than fentanyl group which is contrary to our findings .

The mean dose of total muscle relaxants (vecuronium)used in group A was 8.10+/-0.74 and in group B was 10.80+/-1.23.The mean difference in muscle relaxants dose was found to be statistically significant (Pvalue0.001).The mean dose of vecuronium was slightly higher in group B as compared to group A .lesser dose of vecuronium was seen in Group A as magnesium sulphate acts as a calcium channel blocker at presynaptic nerve terminal which causes decrease in acetylcholine release at motor end plate .In a study done by **K.Gupta et al,** there is significant reduction in dose of muscle relaxant was seen which was similar to our study .

The number of patients in which post-operative nausea and vomiting was present in group A was 6 (30%)and in group B was 10 (50%).Their was no sedation found in both the groups at post operative interval of 0 min , 30 mins , and 60 mins hence statistically non significant. (Pvalue>0.05)The mean pain score was in group A in comparison to group B was found as statistically at all time intervals (pvalue<0.05). similar findings was found in a study done by **J.E Vieira et al.** lower pain scores was seen in magnesium group post-operatively with a P=0.031.

Total number of analgesic requirement in group B was higher as compared to group A , the comparison was found to be statistically significant (pvalue0.002) as magnesium sulphate has the potential to prevent and treat pain by inhibiting NMDA receptors .

In a study conducted by **mehraeen et al** ,preanaethesia induction of 25mg/kg and 50 mg /kg of magnesium sulphate did not reduce pain levels in umbilical hernia surgeries which is contrary to our study may be due to the type of surgery ,time ,method and magnesium dosage.

CONCLUSION:

Through our study we concluded that use of intravenous magnesium sulphate infusion allows us to provide opioid free general anaethesia and opioid related side effects .It also reduces the dose of anaesthetic agents , provides good hemodynamic stability without any adverse

effects as well as it is cost effective .Hence magnesium sulphate has shown efficiency in reducing opioid consumption .

Study Analysis : Interventional

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