



Research Article

EFFECT OF IV MAGNESIUM SULPHATE ON INTRA-OPERATIVE HEMODYNAMICS IN PATIENTS UNDERGOING TOTAL LAPAROSCOPIC HYSTERECTOMY

Meghna Maheshwari¹, Milind Katakwar², Rachna Richi Pandey³ and Paridhi Sharma^{4*}

¹Dept of Anaesthesia SAMC &PGI-Indore

²Dept of Anesthesia, Chirayu Medical College-Bhopal

³Oncoanesthesia and Palliative Care, Tata Medical Centre-Kolkata

⁴Superspeciality Hospital MGM-Indore

ARTICLE INFO

Article History:

Received 06th December, 2021

Received in revised form 14th January, 2022

Accepted 23rd February, 2022

Published online 28th March, 2022

Key words:

Magnesium, laryngoscopy, laparoscopy, hemodynamics.

ABSTRACT

Introduction: The field of laparoscopic surgery has evolved and grown tremendously with the aim of early recovery and reduced post-operative care and hospital stay. Smooth conduction of these surgeries requires better hemodynamic control intraoperatively. Serum magnesium suppresses vasopressin and catecholamine levels that increase during laparoscopy. It potentiates the action of non depolarizing muscle relaxants and decreases potassium release in response to succinylcholine. Hence, this study was conducted to assess the effect of IV Magnesium sulphate on intraoperative hemodynamics in patients undergoing total laparoscopic hysterectomy.

Material and Methods: This cross-sectional, observational study was conducted after obtaining the due permissions from the research advisory committee & Institutional Ethics Committee. A hundred female patients between 30 - 60 years of age & ASA I, ASA II with a BMI between 18.5 – 30.0 kg/m² willing to undergo elective laparoscopic hysterectomy under general anesthesia. The study group M received IV Magnesium Sulphate in a dose of 30 mg/Kg in 100 ml normal saline 15 minutes prior to induction. The placebo Group N received 100 ml Normal Saline 15 minutes prior to induction. The hemodynamic parameters viz Pulse rate (PR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP) Mean Arterial Pressure (MAP) of both groups were recorded intraoperatively. The P Value < 0.05 was considered as level of significance.

Result: The difference between the Age and BMI of the two groups was found to be statistically non-significant (P>0.05). For the baseline, difference between the mean values of the two groups was found to be statistically non-significant (P 0.05). For all other time intervals, the difference between the mean values of the two groups was found to be statistically significant (P 0.05). The HR & MAP values of the Group M are significantly lower than that of the Group N at all time intervals.

Conclusion: The hemodynamic response to laryngoscopy and carboperitoneum was blunted in the group receiving IV Magnesium as compared to the normal saline group.

Copyright©2022 **Meghna Maheshwari et al.** This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

The field of laparoscopic surgery has evolved and grown tremendously, to the extent that it has now become a conventional approach for many surgical diseases traditionally treated with open procedures. The trend of laparoscopic surgeries increased with the aim of early recovery and reduced post-operative care and hospital stay. Smooth conduction of these surgeries requires better hemodynamic control intraoperatively. Stimulation of autonomic pathways during carboperitoneum results in sympathetic nervous system activation, catecholamine release, activation of the renin-angiotensin system, and vasopressin release. It increases mean arterial pressure (MAP) and left ventricular after load. Carboperitoneum causes hypercarbia and acidosis which has direct and indirect sympathoadrenal stimulating effects on cardiovascular functions. An increase in intra abdominal pressure (IAP) with insufflation pushes the diaphragm upwards, causing stiffness of the chest wall and reduced total

lung volume and pulmonary compliance. The Trendelenburg position, functional residual capacity and ventilation-perfusion (V/Q) mismatch are worsened. With the cephalic movement of the lungs, the tracheal tube may migrate endobronchial. Prolonged steep Trendelenburg position increases the risk of cerebral edema and upper airway edema, which may present with stridor after the operation.

Magnesium is an essential cofactor for the Na⁺/K⁺ATPase system and thus is an important regulator of trans membrane electrical potential. Catecholamines, acting by both α -adrenoceptors and β -adrenoceptors, and glucagon lead to the extrusion of Magnesium from intracellular stores. In addition to catecholamines, vasopressin is a major contributor to the hemodynamic changes induced by Carboperitoneum. Magnesium attenuates vasopressin stimulated vasoconstriction. The adverse hemodynamic changes result from the combined effects of pneumoperitoneum, patient position, anesthesia, and hypercapnia from the absorbed carbon dioxide. Serum magnesium suppresses vasopressin and

*Corresponding author: **Paridhi Sharma**
Superspeciality Hospital MGM-Indore

catecholamine levels that increase during laparoscopy. It potentiates the action of non depolarizing muscle relaxants and decreases potassium release in response to succinylcholine. Hence, this study was conducted to assess the effect of IV Magnesium sulphate on intraoperative hemodynamics in patients undergoing total laparoscopic hysterectomy.

MATERIAL AND METHODS

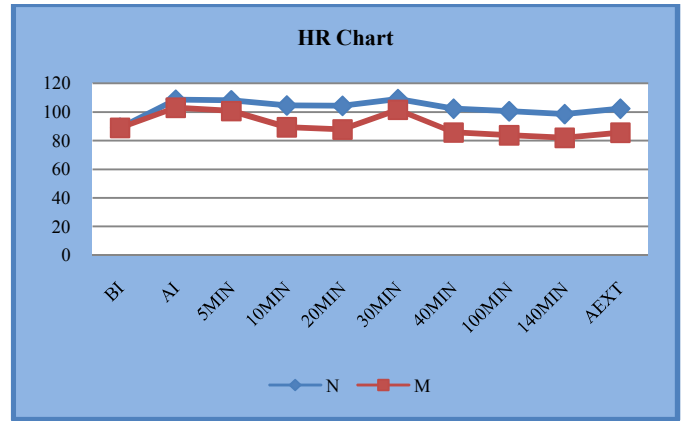
This cross-sectional, observational study was conducted after obtaining the due permissions from the research advisory committee & Institutional Ethics Committee. A hundred female patients between 30 - 60 years of age & ASA I, ASA II with a BMI between 18.5 – 30.0 kg/m² willing to undergo elective laparoscopic hysterectomy under general anesthesia were recruited from the pre-anesthetic checkup (PAC) room. A well informed written, consent in vernacular language was taken from the patient/relative. They were divided into two groups of fifty each. The study group M received IV Magnesium Sulphate in a dose of 30 mg/Kg in 100 ml normal saline 15 minutes prior to induction. The placebo Group N received 100 ml Normal Saline 15 minutes prior to induction. The hemodynamic parameters viz Pulse rate (PR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Mean Arterial Pressure (MAP) of both groups were recorded before induction of anesthesia, immediately after successful tracheal intubation, 5 min, 10 min, 15 min, 30 min & 45 min thereafter, and post-extubation. All drugs administered to the patients were according to their ideal body weight. Intravenous fluid administration was started at 10 ml/kg/hr intra operatively. All patients were premedicated with intravenous Glycopyrrolate 0.2 mg + Midazolam 1 mg + Fentanyl 2 mcg/kg. For induction intravenous Propofol 2 mg/kg + Cisatracurium 0.2 mg/kg was administered. All patients were intubated after 3 minutes from administering cisatracurium with McIntosh blade number 3 or 4 by a single person with a single attempt of 10 seconds. Patients in whom more than 10 seconds were taken to intubate or a second attempt was taken were excluded from the study. Intraoperatively anesthesia was maintained with oxygen + air + isoflurane and cisatracurium 0.03 mg/kg. All patients were administered intravenous paracetamol 1 gm. Intraoperatively a BP above 140/90 mm of Hg was managed first by the administration of IV propofol 20-30 mg. If not controlled, then intravenous antihypertensives like nitroglycerine, labetalol was given in both the groups. Vasopressors (ephedrine, phenylephrine) were administered for a MAP <30% of the baseline value. Student t test for was applied to calculate the significant difference in the mean values of different numeric parameters of two groups. The P Value < 0.05 was considered as level of significance.

OBSERVATION & RESULTS

The difference between the Age and BMI of the two groups was found to be statistically non-significant (P>0.05). It implies that the Age and BMI do not differ significantly within the groups and based on these factors’ groups are comparable.

The above table shows the comparison of mean HR at different time intervals between two groups.

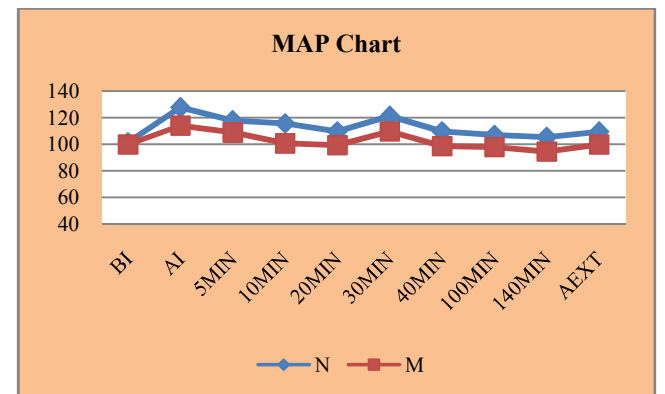
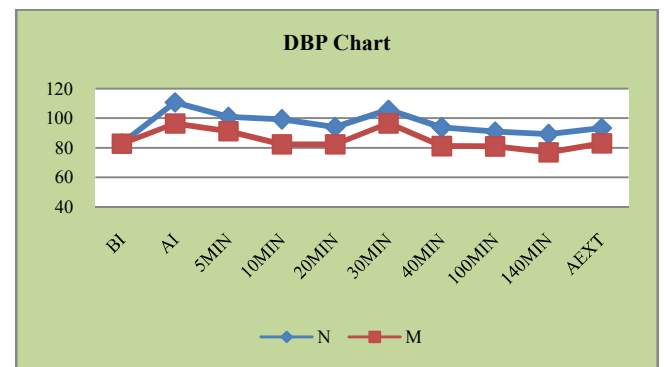
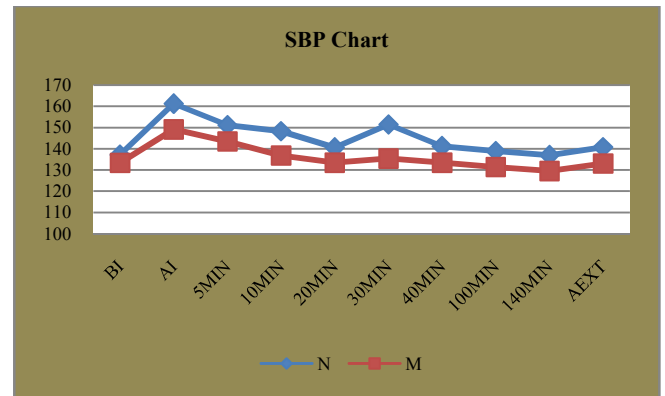
For the baseline, difference between the mean values of the two groups was found to be statistically non-significant (P 0.05)



For all other time intervals, the difference between the mean values of the two groups was found to be statistically significant (P 0.05).

The mean values of the Group M are significantly lower than that of the Group N at all time intervals.

It implies that these values at different post durations (except Pre or Baseline value) vary with the group they belonged to.



Time Interval	Heart Rate		SBP	
	Group M	Group N	Group M	Group N
Baseline	88.92 ± 8.540	89.08 ± 11.492	133.42 ± 9.963	137.08 ± 14.610
	102.98 ± 16.350	108.62 ± 11.250	149.16 ± 9.045	161.24 ± 22.175
At Intubation	101.48 ± 10.651	109.04 ± 12.886	135.42 ± 5.842	151.44 ± 15.397
	85.56 ± 4.73	102.34 ± 8.635	133.06 ± 5.137	140.78 ± 15.695

Time Interval	DBP		MAP	
	Group M	Group N	Group M	Group N
Baseline	82.88 ± 5.773	83.00 ± 10.031	99.76 ± 6.592	101.04 ± 9.278
	96.40 ± 8.182	110.76 ± 17.561	114.00 ± 6.661	127.52 ± 14.728
After Carboperitoneum	96.60 ± 3.387	105.80 ± 13.348	109.54 ± 3.039	121.02 ± 11.812
	83.04 ± 10.608	93.48 ± 10.164	99.76 ± 7.449	109.26 ± 10.544

DISCUSSION

This study was conducted in a tertiary care centre to study the efficacy of IV Magnesium in a dose of 30 mg/Kg, on hemodynamic parameters in patients undergoing Total Laparoscopic Hysterectomy under General Anaesthesia. A hundred patients (ASA I & II) between 30 to 50 years of age were enrolled for this observational study divided into two groups, each comprising of fifty patients. One group was administered with IV Magnesium fifteen minutes before induction, and the other group received normal saline. Hemodynamic parameters like Heart Rate, Blood pressure, and saturation were compared in both the groups throughout the surgery.

The majority of studies done previously on magnesium sulphate were in patients undergoing Laparoscopic Cholecystectomy.¹ Very few studies were done in patients undergoing hysterectomy, and most of them included open hysterectomy patients. In Laparoscopic Hysterectomy, a steep Trendelenburg position is required for optimal visualization of the uterus, thereby altering the hemodynamic profile significantly. In this respect, our study proved to be unique.

Heart Rate

The baseline heart rate was non-significant between both the groups (88.92 ± 8.540 in group M and 89.08 ± 11.492 in Group N). There was a significant difference in the mean heart rate of both the groups at intubation (102.98 ± 16.350 in group M and 108.62 ± 11.250 in Group N), after carboperitoneum (101.48 ± 10.651 in group M and 109.04 ± 12.886 in Group N), and at Extubation (85.56 ± 4.73 in group M and 102.34 ± 8.635 in Group N). When heart rate in both the groups was compared to their baseline values, the group receiving IV Magnesium showed a non-significant increase in heart rate throughout the surgery, and values were close to baseline even at carboperitoneum and at extubation, whereas in the normal saline group, there was a significant increase in heart rate throughout the study. In the Group M, values for heart rate were statistically non-significant before carboperitoneum when compared with baseline. This implies excellent hemodynamic control of heart rate in the magnesium group throughout the study period.

Systolic Blood Pressure

The baseline systolic blood pressure was statistically non-significant between both the groups (133.42 ± 9.963 in group M and 137.08 ± 14.610 in Group N). There was a significant difference in the mean systolic blood pressure of both the groups at intubation (149.16 ± 9.045 in group M and 161.24 ± 22.175 in Group N), after carboperitoneum (135.42 ± 5.842 in group M and 151.44 ± 15.397 in Group N) and at extubation (135.42 ± 5.842 in group M and 151.44 ± 15.397 in Group N). It was observed that hemodynamic response to laryngoscopy and carboperitoneum was blunted in the group receiving IV Magnesium as compared to the normal saline group. There was a significant increase in SBP in the normal saline group compared with baseline values, but no such results were observed in the IV magnesium group.

Diastolic Blood Pressure

The baseline diastolic blood pressure was non-significant between both the groups (82.88 ± 5.773 in group M and 83.00 ± 10.031 in Group N). There was a significant difference in the mean diastolic blood pressure of both the groups at intubation (96.40 ± 8.182 in group M and 110.76 ± 17.561 in Group N), after carboperitoneum (96.60 ± 3.387 in group M and 105.80 ± 13.348 in Group N) & at extubation (83.04 ± 10.608 in group M and 93.48 ± 10.164 in Group N). On comparing diastolic BP in both the groups from their baseline values, there was a significant increase in the normal saline group, but no increase in DBP was observed in the group receiving IV Magnesium showing excellent hemodynamic control.

Mean Arterial Pressure

The baseline mean blood pressure was statistically non-significant between both the groups (99.76 ± 6.592 group M and 101.04 ± 9.278 in Group N). There was a significant difference in the mean blood pressure of both the groups at intubation (114.00 ± 6.661 in group M and 127.52 ± 14.728 in Group N), after carboperitoneum (109.54 ± 3.039 in group M and 121.02 ± 11.812 in Group N) & at extubation (99.76 ± 7.449 in group M and 109.26 ± 10.544 in Group N). The mean MAP values of the Group M are significantly lower than that of the Group N at all time intervals. When compared to baseline values, MAP values were statistically insignificant in the Group M. On the contrary, Group N showed a significant increase in MAP values throughout the study period when compared to baseline.

Taheri *et al*² studied the effect of a single dose of IV Magnesium on hemodynamics and post-op analgesia in Total Abdominal Hysterectomy (TAH). He selected 20 females, each receiving 50mg/kg dose of IV Magnesium and IV Normal saline, respectively. Even though our study was carried out with patients receiving 30mg/kg dose of IV Magnesium along with steep Trendelenburg position and all effects of carboperitoneum, hemodynamic parameters were better controlled in the Group M showing similar results.

Few studies conducted in laparoscopic cholecystectomy observed the effect of a bolus dose of IV Magnesium on carboperitoneum. Jeet *et al*³ administered a 50 mg/kg bolus dose of IV Magnesium 2-3 minutes before carboperitoneum. Paulet *et al*⁴ reduced the dose to 30 mg/kg with normal saline as the control in both studies. They observed that IV Magnesium attenuates the adverse hemodynamic response to carboperitoneum, which was similar to our study.

Ghodraty *et al*⁵ studied the effect of IV Magnesium in laparoscopic cholecystectomy using 50 mg/kg IV Magnesium as a loading dose before induction with normal saline as the control group. Although variations in heart rate and mean arterial pressure was less in the group receiving IV Magnesium as compared to normal saline, it was non-significant after carboperitoneum. Results were similar to our study at intubation and extubation, showing a significant difference in hemodynamic parameters between the two groups.

Kiaee *et al*⁶ studied hemodynamic response to intubation in coronary artery bypass grafting using IV Magnesium, IV lignocaine, and normal saline as a comparative group. A bolus dose of IV Magnesium 50 mg/kg and IV lignocaine 1.5 mg/kg were given 5 minutes before induction. Although a significant decrease in blood pressure was observed with both drugs at intubation as compared to normal saline, patients receiving Magnesium had better hemodynamic stability than lignocaine. Similar results were observed in our study, but since it is an open surgery, response to carboperitoneum and position was not compared.

CONCLUSION

With the advent of laparoscopic surgery and its increasing application, hemodynamic alterations should be managed wisely. Our study was conducted on two groups of fifty patients each undergoing TLH under General Anesthesia. One group received IV Magnesium 30 mg/kg bolus dose before induction while another group received normal saline. Hemodynamic parameters and VAS scale were assessed. There was a significant decrease in HR and BP in IV Magnesium Group as compared to control group. Magnesium has shown promising results in attenuating adverse hemodynamic responses to laryngoscopy and carboperitoneum.

Reference

1. Das M, Ray M, Mukherjee G. Haemodynamic changes during laparoscopic cholecystectomy: Effect of clonidine premedication. *Indian Journal of Anaesthesia*. 2007 May 1;51 (3):205.
2. Taheri A, Haryalchi K, Mansour Ghanaie M, Habibi Arejan N. Effect of low-dose (single-dose) magnesium sulfate on postoperative analgesia in hysterectomy patients receiving balanced general anesthesia. *Anesthesiology Research and Practice*. 2015 Jan 1; 2015.
3. Jee D, Lee D, Yun S, Lee C. Magnesium sulphate attenuates arterial pressure increase during laparoscopic cholecystectomy. *British journal of anaesthesia*. 2009 Oct 1;103(4):484-9.
4. Paul S, Biswas P, Bhattacharjee DP, Sengupta J. Effects of magnesium sulfate on hemodynamic response to carbon dioxide carboperitoneum in patients undergoing laparoscopic cholecystectomy. *Anesthesia, essays and researches*. 2013 May;7(2):228.
5. Ghodraty MR, Zamani MM, Jamili S, Pournajafian A, Salemi P, Ghadrdoost B, Parsa SF, Kholdebarin A, Tashayoei M, Mougouee A. The Effects of Magnesium Sulfate Loading on Hemodynamic Parameters During Laparoscopic Cholecystectomy: Randomized Controlled Trial. *Archives of Anesthesiology and Critical Care*. 2017 Apr 29;3 (2):313-8.
6. Kiaee MM, Safari S, Movaseghi GR, Dolatabadi MR, Ghorbanlo M, Etemadi M, Amiri SA, Zamani MM. The effect of intravenous magnesium sulfate and lidocaine in hemodynamic responses to endotracheal intubation in elective coronary artery bypass grafting: a randomized controlled clinical trial. *Anesthesiology and pain medicine*. 2014 Aug;4 (3).

How to cite this article:

Meghna Maheshwari *et al* (2022) 'Effect of iv Magnesium Sulphate on Intra-Operative Hemodynamics in Patients Undergoing Total Laparoscopic Hysterectomy', *International Journal of Current Advanced Research*, 11(03), pp. 480-483. DOI: <http://dx.doi.org/10.24327/ijcar.2022.483.0106>
