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COMPARATIVE STUDY ON EFFECT OF IV MAGNESIUM SULFATE AND FENTANYL CITRATE ON HEMODYNAMIC CHANGES DURING GENERAL ANAESTHESIA

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ABSTRACT: AIM & OBJECTIVE: Aim of our study was to compare the effects of magnesium sulfate and fentanyl citrate on hemodynamic variables during anaesthesia and surgery **MATERIAL AND METHODS:** 70 patient (ASA grade I & II) of either sex and age group of 20-50 years posted for various intra peritoneal surgeries under general anaesthesia were divided into two groups: Group A were given inj. Magnesium sulfate 30mg/kg 5min. before induction. 10mg/kg 5min. prior to skin incision and 10mg/kg every 30min. interval Group B were given inj. Fentanyl citrate 2mcg/kg, 0.5mcg/kg and 0.5mcg/kg at similar time intervals. Pre anaesthetic checkup with relevant investigation carried out. Study drugs were repeated 5 min. Before skin incision and at every 30min. Interval thereafter. HR, SBP, DBP were recorded at 0 min(basal value), after study drug, immediately after intubation, at every 5min interval for next 30min thereafter every 15min till 90min. **RESULT:** Analysis revealed that there was no significant changes in HR, SBP & DBP were observed during the study period in both the groups. But side effects like respiratory depression, sedation, nausea, vomiting and restlessness are more common in group B as compared to group A. **CONCLUSION:** From our study we concluded that although the action of Mgso₄ is not superior than fentanyl, however, use of Mgso₄ has been associated with less side effects like respiratory depression, postop sedation, etc. So after this study we concluded MgSO₄ could be a cost effective, easily available and useful alternative to fentanyl.

KEYWORDS: Magnesium sulfate, fentanyl citrate & general anaesthesia.

INTRODUCTION: Magnesium sulfate has been used as anticonvulsant and antiarrhythmic agent in the past.^[1,2] Recently, magnesium has been shown to have antinociceptive effect in animal and human models of chronic pain^[3,4] mainly due to its antagonist effect on NMDA receptors^[5] and calcium ion channels.^[6] It also inhibits the catecholamine release from adrenergic nerve terminals and adrenal medulla.^[7] For these reasons several authors have used magnesium sulfate to attenuate the pressor response to endotracheal intubation and perioperative analgesia.^[8,9] Fentanyl, a widely used narcotic analgesic produces effective analgesia and attenuation of the cardiovascular,^[10] hormonal and metabolic responses to stress but has the disadvantage of prolonged respiratory depression.^[11]

MATERIAL AND METHODS: After taking written & informed consent, 70 patient (ASA grade I & II) of either sex and age group of 20-50 years posted for various intra peritoneal surgeries under general anaesthesia were divided into two groups:

Group A were given inj. Magnesium sulfate 30mg/kg 5min. before induction. 10mg/kg 5min. prior to skin incision and 10mg/kg every 30min. interval.

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Group B were given inj. Fentanyl citrate 2mcg/kg, 0.5mcg/kg and 0.5mcg/kg at similar time intervals Pre anaesthetic checkup with relevant investigation carried out Pts. Connected to monitors, base line HR, BP, SPO2 recorded.

IV line secured and all patients pre medicated with inj. ranitidine 1mg/kg i.v. & inj. Ondansetron 4 mg i.v. and the study drug was given slowly over 60 sec, then general anaesthesia was induced with thiopentone sodium 6mg/kg followed by succinylcholine 2mg/kg.

Endotracheal intubation with appropriate sized tube was done and IPPV started, anaesthesia was maintained with N2O:O2 (66%:33%) + halothane 0.2-0.6% and muscle relaxation was obtained with atracurium loading dose of 0.5mg/kg and 0.1mg/kg of maintenance doses.

Study drugs were repeated 5 min. Before skin incision and at every 30min. Interval thereafter. All the patients were reversed with glycopyrrolate 0.01mg/kg and neostigmine 0.05mg/kg.

HR, SBP, DBP were recorded at 0 min (basal value), after study drug, immediately after intubation, at every 5min interval for next 30min thereafter every 15min till 90min.

EXCLUSION CRITERIA:

- Pts outside the above mentioned age group.
- Pts allergic to the drugs.
- Pts with any major organ dysfunction.
- Pts on Ca++ channel blockers, hypnotic, or narcotic analgesics.
- Values are presented as mean $\pm$ SD.
- Comparison of quantitative data between two groups was done with unpaired t test.
- Data with $p < 0.05$ was considered significant.

RESULTS AND ANALYSIS: TABLE-1 Shows that in both the groups, Age (in years) 33.73 ± 7.24 & 34.93 ± 7.27 , Sex ratio (M: F) 22:13 & 20:15 and Weight (in kg) 48.23 ± 6.34 & 47.6 ± 7 in group A & B respectively.

Table-2 shows, a clinically significant rise (8.4%) in HR was observed after iv magnesium sulfate, which further decline to baseline values towards the end of study.

Table 3 & 4 shows, both the drugs produced statistically insignificant ($p > 0.05$) fall in systolic blood pressure and diastolic blood pressure after initial injection but later statistically insignificant rise was observed up to 5 min. after intubation. No significant changes were observed during rest of the study period in both the groups.

Table-5 shows that side effects like nausea, vomiting respiratory depression, sedation and restlessness are more common in group B as compared to group A.

DISCUSSION: Fentanyl plays an important role in balanced general anaesthesia by virtue of meeting all aspects of balanced anaesthesia like narcosis, analgesia and attenuation of stress responses, but apart from associated respiratory depression, chest rigidity and PONV, its procurement in India is difficult due to rigid narcotic regulation.

Although obstetricians have been using magnesium sulfate in prevention or treatment of convulsion in eclampsia, recently reports have appeared about its role as analgesic during intra and post-operative period.^[10-13]

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In this comparative study we evaluated the circulatory changes after the injection of magnesium sulfate and fentanyl citrate during anaesthesia and surgery. Oliver et al used similar doses as adjuvant to general anaesthesia in abdominal hysterectomies.^[14]

In this comparative study we evaluated the circulatory changes after iv magnesium sulfate and iv fentanyl citrate during general anaesthesia and surgery.

A clinically significant rise (8.4%) in HR was observed after iv magnesium sulfate, which further decline to baseline values towards the end of study. Ability of magnesium sulfate to inhibit acetylcholine release from vagus nerve in intact animal has been attributed to this effect.^[15]

As shown in Table 3 both the drugs produced statistically insignificant ($P>0.05$) fall in blood pressure immediately after initial injection but later in the course of study insignificant rise was observed up to 5 minutes after intubation. No significant changes were observed during rest of the study period in both the groups. Our results are in accordance with Puri et al^[10] who also observed increase in pulse rate after magnesium sulfate which further increased after intubation. They noted a significant fall in MAP after MgSO₄ at pre-induction stage with a sudden rise in post intubation period. James et al^[16] also observed a rise in blood pressure after intubation in patient pretreated with i.v. magnesium sulfate.

The stability with magnesium sulfate could be attributed to its antagonistic activity on Ca⁺⁺^[5] and NMDA receptor^[6] or inhibition of catecholamine release^[7] Or vaso dilatory effect of the ion^[17] or a combination of all these. Fentanyl suppresses the nociceptive stimulation or centrally decreases the sympathetic tone.^[18] MgSO₄ in several studies is shown to reduce the requirement of narcotics for postoperative pain due to analgesic and co-analgesic effects.^[19,20]

CONCLUSION: From our study we concluded that although the action of Mgso₄ is not superior to fentanyl, however, use of Mgso₄ has been associated with fewer side effects like respiratory depression, postop sedation, etc. So after this study we concluded MgSO₄ could be a cost effective, easily available and useful alternative to fentanyl.

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DATA	GROUP A	GROUP B
Age (in years)	33.73 ± 7.24	34.93 ± 7.27
Sex ratio (M: F)	22:13	20:15
Weight (in kg)	48.23 ± 6.34	47.6 ± 7.4
TABLE 1: DEMOGRAPHIC PROFIL		

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Time of observation	Group A	Group B	P-value
Basal value	87.3±5.9	88.4±4.33	>0.05
After study drug	96.5±4.03	87.5±4.88	>0.05
After intubation	92.56±3.58	90.32±3.56	>0.05
5 min.	88.37±5.63	89.6±4.24	>0.05
10 min.	87.9±4.8	88.13±5.2	>0.05
15 min.	87.34±3.98	87.45±4.3	>0.05
20 min.	87.25±3.78	87.4±4.7	>0.05
25 min.	88.26±4.23	87.56±4.23	>0.05
30 min.	87.42±4.68	86.4±4.78	>0.05
45 min.	87.56±4.47	86.6±4.65	>0.05
60 min.	85.78±3.79	86.26±4.42	>0.05
75 min.	85.6±3.68	85.6±4.12	>0.05
90 min.	85.2±3.45	85.54±3.86	>0.05

Table 2: showing Mean (± SD) Heart Rate in Two Group

Time of observation	Group A	Group B	P-value
Basal value	122.0±11.6	121.4±10.8	>0.05
After study drug	121.8±10.87	121.16±11.6	>0.05
After intubation	128.59±12.6	126.6±11.86	>0.05
5 min.	123.12±11.85	122.8±9.87	>0.05
10 min.	121.84±10.7	122.6±10.6	>0.05
15 min.	121.6±9.87	122.34±11.2	>0.05
20 min.	121.46±10.8	122.65±10.5	>0.05
25 min.	121.34±10.7	121.8±9.78	>0.05
30 min.	122.6±11.2	120.68±9.84	>0.05
45 min.	122.66±11.3	120.5±10.6	>0.05

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60 min.	121.8±11.16	121.6±9.76	>0.05
75 min.	120.8±10.8	120.44±9.4	>0.05
90 min.	121.7±10.65	120.2±9.15	>0.05

Table 3: showing Mean(± SD) SBP in Two Groups

Time of observation	Group A	Group B	P-value
Basal value	78.46±7.6	79.3±8.46	>0.05
After study drug	77.42±7.46	78.64±8.26	>0.05
After intubation	82.76±8.68	83.05±9.40	>0.05
5 min.	79.24±8.36	78.86±8.96	>0.05
10 min.	78.55±8.42	78.6±8.76	>0.05
15 min.	78.64±7.86	78.42±8.66	>0.05
20 min.	78.26±7.66	77.78±8.34	>0.05
25 min.	78.4±8.24	77.65±8.56	>0.05
30 min.	77.84±7.66	77.4±8.28	>0.05
45 min.	77.76±7.4	77.80±8.64	>0.05
60 min.	77.36±7.64	77.24±7.86	>0.05
75 min.	77.45±7.46	76.8±7.64	>0.05
90 min.	77.2±7.26	76.5±7.24	>0.05

Table 4: showing Mean (± SD) DBP in Two Groups

Observation	Group A		Group B	
	n	%	n	%
Nausea	3	10.0	2	6.66
Vomiting	2	6.66	1	3.33
Respiratory Depression	-	-	1	3.33
Sedation	-	-	3	10.0
Restlessness	2	6.66	2	6.66

TABLE 5: SIDE EFFECT PROFILE

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