

Original article:

Study of effects of Intravenous Magnesium sulphate on Heart rate and BP during laryngoscopy and endotracheal intubation

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Abstract:

Background: Laryngoscopy and endotracheal intubation are essential procedures in surgical settings, but they can induce significant hemodynamic stress responses. Pharmacological agents like intravenous magnesium sulphate and dexmedetomidine have been studied for their potential to mitigate these responses.

Objective: This prospective, comparative study aimed to evaluate and compare the effects of intravenous magnesium sulphate and dexmedetomidine in attenuating the hemodynamic stress response during laryngoscopy and endotracheal intubation.

Methods: The study was conducted at a tertiary care center and involved 60 patients, randomly assigned into two groups. Group A (n=30) received intravenous magnesium sulphate (50mg/kg) and normal saline, while Group B (n=30) received intravenous dexmedetomidine (1mcg/kg) and normal saline. The patients' demographics, including gender and body mass index (BMI), were recorded. Side effects, such as dry mouth, nausea, and vomiting, were also assessed.

Results: Both groups showed comparable baseline characteristics in terms of gender distribution and BMI. The incidence of side effects, including dry mouth, nausea, and vomiting, was low in both groups, with no significant difference observed between them ($p>0.05$).

Conclusion: Intravenous magnesium sulphate and dexmedetomidine demonstrated similar safety profiles in attenuating the hemodynamic stress response during laryngoscopy and endotracheal intubation. Both drugs were well-tolerated, and the incidence of side effects was minimal. These findings support their use as effective pharmacological agents for airway management during elective non-cardiac surgeries.

Keywords: Laryngoscopy, Endotracheal Intubation, Hemodynamic Stress Response

Introduction:

Laryngoscopy and endotracheal intubation are commonly performed medical procedures in various surgical and emergency settings. While these interventions are essential for airway management, they can elicit significant physiological responses, particularly on the cardiovascular system. One of the primary concerns during these

procedures is the hemodynamic changes, including an increase in heart rate and blood pressure, which may be detrimental to patients with pre-existing cardiovascular conditions or those undergoing high-risk surgeries.

Intravenous Magnesium sulphate has emerged as a potential pharmacological agent to mitigate the adverse hemodynamic effects of laryngoscopy and endotracheal intubation. Magnesium, an essential cation in various cellular processes, possesses vasodilatory and anti-arrhythmic properties, making it a promising candidate for attenuating the cardiovascular response to these procedures. Its ability to antagonize calcium influx and modulate smooth muscle contractility has been well-documented, indicating its potential to decrease systemic vascular resistance and stabilize cardiac rhythms.

Several studies have investigated the effects of Intravenous Magnesium sulphate on heart rate and blood pressure during laryngoscopy and endotracheal intubation. However, there remains a need for a comprehensive and up-to-date review of the existing literature, considering the variability in patient populations, dosage regimens, and procedural techniques. Therefore, this study aims to systematically analyze and synthesize the available evidence to determine the efficacy and safety of Intravenous Magnesium sulphate as a premedication agent in attenuating the cardiovascular response to laryngoscopy and endotracheal intubation. The findings from this study may have significant clinical implications for optimizing patient care during these critical interventions and improving outcomes for patients at risk of adverse cardiovascular events.

Material and methods:

This hospital-based prospective, comparative study aimed to evaluate and compare the efficacy of intravenous 50% magnesium sulphate (MgSO₄) and dexmedetomidine in attenuating the hemodynamic stress response during laryngoscopy and endotracheal intubation. The study was conducted over a period of 18 months at a tertiary care center in the Department of Anaesthesiology, encompassing both outpatient and inpatient settings.

The study population comprised patients of both sexes, aged between 18 and 50 years, belonging to American Society of Anesthesiologists (ASA) grade I and II. These patients were scheduled for elective non-cardiac surgeries under general anesthesia. To ensure homogeneity in the study groups, patients with Mallampati airway assessment grades I and II were included. Additionally, patients were required to understand Hindi, Marathi, or English and provide written informed consent for participation.

The sample size for the study consisted of 60 patients, randomly allocated into two groups. Group A, consisting of 30 patients, received intravenous injections of magnesium sulphate at a dose of 50mg/kg, along with 10ml of 0.9% normal saline. Group B, also comprising 30 patients, was administered intravenous dexmedetomidine at a dose of 1mcg/kg, along with 10ml of 0.9% normal saline.

Certain exclusion criteria were applied to ensure the validity of the study. Patients requiring emergency surgeries or those with anticipated difficult intubation were excluded. Patients with hematological diseases, bleeding disorders, abnormal coagulopathy, or cardiovascular conditions such as rheumatic heart disease (RHD) or ischemic heart disease (IHD) were also excluded from the study. Patients who were on beta blockers or calcium channel blockers were not included in the study population.

By comparing the effects of magnesium sulphate and dexmedetomidine in attenuating the hemodynamic stress response during laryngoscopy and endotracheal intubation, this study aimed to provide valuable insights into the use of these pharmacological agents in improving patient outcomes during elective non-cardiac surgeries. The findings from this research hold the potential to influence clinical practice, enhancing the safety and efficacy of airway management in these surgical settings.

Results:

The study groups, Group A and Group B, were well-balanced in terms of gender distribution, with Group A comprising 10 male patients (33.3%) and 20 female patients (66.7%), while Group B had 7 male patients (23.3%) and 23 female patients (76.7%). The chi-square test revealed no statistically significant difference between the two groups concerning gender distribution ($p>0.05$). Similarly, the distribution of body mass index (BMI) categories was comparable between the groups. In Group A, 18 patients (60%) fell within the normal BMI range, whereas 6 patients (20%) were classified as overweight, and another 6 patients (20%) were categorized as obese. In Group B, 20 patients (66.7%) had a normal BMI, while 7 patients (23.3%) were overweight, and 3 patients (10%) were obese. The mean BMI for patients in Group A and Group B was 25.47 ± 3.81 kg/m² and 24.49 ± 3.09 kg/m², respectively. The difference in mean BMI between the two groups was not statistically significant, as determined by the Student t-test ($p>0.05$).

The balanced distribution of gender and BMI across both groups supports the internal validity of the study and reduces potential biases related to these factors. By establishing comparable baseline characteristics, the researchers ensured that any observed differences in hemodynamic responses during laryngoscopy and endotracheal intubation can be more confidently attributed to the effects of the administered medications (intravenous magnesium sulphate or dexmedetomidine) rather than patient demographics or body composition. These findings enhance the reliability and generalizability of the study results, providing valuable insights into the comparative effectiveness of the two pharmacological agents in attenuating the hemodynamic stress response in the context of airway management during elective non-cardiac surgeries.

Comparison of Heart Rate (per min) at various time intervals

Intraoperatively throughout the study heart rate values were comparable in both the groups. There was no significant difference between the groups as per Student t-test ($p>0.05$).

Table 1: Comparison of Heart Rate (per min) at various time intervals

Heart Rate (per min)	Group A		Group B		p value
	Mean	SD	Mean	SD	
Preinduction	81.47	7.45	82.13	7.75	>0.05
1 min	82.27	7.80	81.37	8.66	>0.05
3 mins	81.07	9.82	80.47	9.48	>0.05
5 mins	83.07	6.68	82.07	9.09	>0.05
10 mins	81.93	10.04	79.13	11.93	>0.05

Comparison of Systolic Blood Pressure [SBP (mmHg)] at various time intervals

Intraoperatively throughout the study systolic blood pressure levels were comparable in both the groups. There was no significant difference between the groups as per Student t-test ($p>0.05$).

Table 2: Comparison of Systolic Blood Pressure [SBP (mmHg)] at various time intervals

SBP (mm Hg)	Group A		Group B		p value
	Mean	SD	Mean	SD	
Preinduction	120.68	9.49	122.12	11.45	>0.05
1 min	120.80	8.55	122.66	11.17	>0.05
3 mins	121.16	9.18	123.62	9.78	>0.05
5 mins	123.72	9.28	122.84	9.31	>0.05
10 mins	121.20	8.92	122.33	8.42	>0.05

Comparison of Diastolic Blood Pressure [SBP (mmHg)] at various time intervals

Intraoperatively throughout the study diastolic blood pressure levels were comparable in both the groups. There was no significant difference between the groups as per Student t-test ($p>0.05$).

Table 3: Comparison of Diastolic Blood Pressure [SBP (mmHg)] at various time intervals

DBP (mm Hg)	Group A		Group B		p value
	Mean	SD	Mean	SD	
Preinduction	80.10	8.22	78.64	8.23	>0.05
1 min	70.52	6.85	71.34	8.09	>0.05
3 mins	70.36	6.11	71.98	7.65	>0.05
5 mins	72.14	6.29	72.86	7.33	>0.05
10 mins	72.96	6.26	73.76	7.09	>0.05

Comparison of Mean Arterial Pressure MAP (mmHg) at various time intervals

Intraoperatively throughout the study mean arterial pressure values were comparable in both the groups. There was no significant difference between the groups as per Student t-test ($p>0.05$).

Table 4: Comparison of Mean Arterial Pressure MAP (mmHg) at various time intervals

MAP (mm Hg)	Group A		Group B		p value
	Mean	SD	Mean	SD	
Preinduction	96.97	8.18	94.59	7.97	>0.05
1 min	94.21	10.09	92.17	9.04	>0.05
3 mins	91.66	9.89	91.21	7.26	>0.05
5 mins	89.76	9.22	88.69	7.52	>0.05
10 mins	87.93	8.68	86.21	7.17	>0.05

Comparison of SpO2 (%) at various time intervals

The SpO2 levels were comparable between the groups throughout the study and it was statistically not significant as per Student t-test ($p > 0.05$).

Table 5: Comparison of SpO2 (%) at various time intervals

SpO2 (%)	Group A		Group B		p value
	Mean	SD	Mean	SD	
Preinduction	98.14	1.31	98.20	1.11	>0.05
1 min	98.08	1.34	98.26	1.21	>0.05
3 mins	98.16	1.22	98.16	1.09	>0.05
5 mins	98.16	1.31	98.02	1.27	>0.05
10 mins	98.04	1.32	98.10	1.22	>0.05

Distribution of patients according to Side Effects

2 (6.7%) patients in Group A had dry mouth while 1 (3.3%) patient each had nausea and vomiting. 3 (10%) patients in Group B had dry mouth and 1 (3.3%) patient had nausea. There was no significant difference between the groups as per Chi-Square test ($p > 0.05$).

Table 6: Distribution of patients according to Side Effects

Side Effects	Group A		Group B		p Value
	N	%	N	%	
Dry Mouth	2	6.7%	3	10%	>0.05
Nausea	1	3.3%	1	3.3%	
Vomiting	1	3.3%	0	-	

Discussion:

The results of the study indicate that there were minimal side effects reported in both Group A (patients administered with intravenous magnesium sulphate) and Group B (patients administered with intravenous dexmedetomidine) during the evaluation of the hemodynamic stress response during laryngoscopy and endotracheal intubation. The most commonly reported side effect in both groups was dry mouth, with 6.7% of patients in Group A and 10% in Group B experiencing this adverse event. However, the difference in the incidence of dry mouth between the two groups was not statistically significant, as indicated by the p-value (>0.05).

Similarly, both groups had a low occurrence of nausea, with 3.3% of patients experiencing this side effect in each group. Furthermore, Group A had one patient (3.3%) reporting vomiting, while no patients in Group B experienced vomiting during the study period. However, since there were no cases of vomiting in Group B, statistical comparison between the groups was not possible for this particular side effect.

The absence of statistically significant differences in the occurrence of side effects between the two study groups suggests that both intravenous magnesium sulphate and dexmedetomidine were well-tolerated by patients undergoing laryngoscopy and endotracheal intubation. These findings are consistent with previous research that has demonstrated the safety and favorable side effect profiles of both medications in various clinical settings.

It is essential to note that the small sample size might have limited the detection of rare side effects, and a larger study cohort may provide further insights into the safety profiles of these drugs. Additionally, the study's short duration may not have captured delayed or longer-term adverse events that could occur with prolonged use of these medications.

In conclusion, this comparative study found no significant differences in the occurrence of side effects between intravenous magnesium sulphate and dexmedetomidine when used for attenuating the hemodynamic stress response during laryngoscopy and endotracheal intubation. Both medications demonstrated good tolerability, and the incidence of side effects was minimal in both groups. These results support the use of both intravenous magnesium sulphate and dexmedetomidine as safe and effective pharmacological agents in clinical practice for airway management during elective non-cardiac surgeries. However, further research with larger sample sizes and longer follow-up periods is warranted to validate these findings and provide a more comprehensive understanding of the safety profiles of these medications in this specific context.

Conclusion:

Intravenous 50% magnesium sulphate (MgSO₄) and dexmedetomidine premedication for attenuation of haemodynamic stress response during laryngoscopy and endotracheal intubation are equally effective with no significant side effects. Hence Magnesium Sulphate (MgSO₄) can be used for attenuation of haemodynamic stress response during endotracheal intubation. Also, both drugs have contributory antinociceptive effects that maybe beneficial for controlling postoperative pain and no significant difference in side effects.

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