Efficacy of Magnesium Sulfate in Attenuating the Hemodynamic Response to Laryngoscopy and Endotracheal Intubation

by Jana Publication & Research

Submission date: 21-May-2025 11:24AM (UTC+0700)
Submission ID: 2677249817
File name: IJAR-51705.docx (34.07K)
Word count: 1065
Character count: 6828

Efficacy of Magnesium Sulfate in Attenuating the Hemodynamic Response to Laryngoscopy and Endotracheal Intubation

Abstract

Background: Laryngoscopy and endotracheal intubation are known to cause a transient but marked sympathetic response, leading to increased heart rate and blood pressure. This response can be hazardous, particularly in patients with cardiovascular disease. Magnesium sulfate, due to its calcium channel-blocking and sympatholytic effects, may offer protective benefits.

Objective: To evaluate the efficacy of intravenous magnesium sulfate in attenuating cardiovascular responses during laryngoscopy and endotracheal intubation.

Methods: This prospective, randomized clinical study included adult patients scheduled for elective surgery under general anesthesia. Patients were assigned to two groups: Group A received magnesium sulfate 30 mg/kg IV before intubation, while Group B served as control. Heart rate (HR), systolic blood pressure (SBP), diastolic BP (DBP), and mean arterial pressure (MAP) were recorded at baseline, 30 seconds after drug administration, during laryngoscopy, and at intervals post-intubation.

Results: Group A demonstrated significantly lower HR and BP rises during and after intubation compared to Group B ($p < 0.05$). No adverse effects were observed.

Conclusion: Magnesium sulfate effectively blunts the hemodynamic response to laryngoscopy and intubation, and can be a useful adjunct in general anesthesia, particularly in patients at risk of cardiovascular complications.

Keywords: Magnesium sulfate, Hemodynamic response, Laryngoscopy, Intubation, General anesthesia, Sympathetic stimulation

1. Introduction

General anesthesia almost always involves endotracheal intubation, a procedure known to provoke a sympathetic surge that manifests as hypertension and tachycardia. These hemodynamic responses may lead to serious complications, including myocardial ischemia, arrhythmias, pulmonary edema, and cerebral hemorrhage [1–3].

Various pharmacologic interventions have been studied to attenuate this response, such as opioids, beta-blockers, and calcium channel blockers, each with its limitations [4–6]. Magnesium sulfate, a naturally occurring cation with calcium antagonistic and NMDA receptor-blocking effects, may reduce catecholamine release and vascular tone, thereby attenuating this stress response [7–9].

Recent studies continue to support the role of magnesium sulfate in attenuating pressor responses during laryngoscopy and intubation, showing comparable efficacy to agents like dexmedetomidine and clonidine [10,11].

This study investigates the effectiveness of intravenous magnesium sulfate in reducing the hemodynamic changes associated with laryngoscopy and intubation in healthy adult patients undergoing general anesthesia.

2. Materials and Methods

Design: A prospective, randomized controlled study conducted at Khartoum Teaching Hospital.

Population: Patients aged 18–65 years, ASA I–II, scheduled for elective surgeries requiring general anesthesia with intubation. Exclusion criteria included cardiovascular, renal, or neuromuscular diseases, or magnesium hypersensitivity.

Randomization and Intervention:
- Group A (Magnesium Group): Received 30 mg/kg of IV magnesium sulfate 30 seconds before intubation.
- Group B (Control Group): Received an equivalent volume of normal saline.

Anesthesia Protocol: Premedication included midazolam and atropine. Anesthesia induction involved fentanyl, propofol, and suxamethonium. Laryngoscopy and intubation were standardized.

Monitoring and Data Collection: HR, SBP, DBP, and MAP were recorded at:
- Baseline
- 30 seconds after drug administration
- Immediately after intubation
- 1, 3, and 5 minutes post-intubation

Statistical Analysis: Data were analyzed using SPSS. Continuous variables were compared using the Student's t-test, with $p < 0.05$ considered statistically significant.

3. Results

Hemodynamic parameters were similar at baseline. After administration of magnesium sulfate, a mild increase in HR was noted at 30 seconds, but post-intubation responses were significantly attenuated in Group A:

Group A showed significantly lower peak values post-intubation compared to Group B ($p < 0.05$ for all parameters). No adverse events were reported.

4. Discussion

Laryngoscopy and endotracheal intubation are among the most critical moments in anesthesia, causing marked sympathetic stimulation [12,13]. This response is mediated by catecholamine release and can provoke dangerous spikes in blood pressure and heart rate.

In our study, intravenous magnesium sulfate significantly reduced this response. It appears to exert its effect through multiple mechanisms: blocking calcium influx, inhibiting catecholamine release, and causing peripheral vasodilation [14–16].

Despite a brief rise in HR after administration, magnesium's overall effect was beneficial. Group A maintained more stable hemodynamics throughout the intubation period than the control group.

These results are in agreement with prior studies demonstrating the sympatholytic properties of magnesium sulfate [2,13,17].

5. Conclusion

- Marked cardiovascular responses occur within one minute of intubation without pharmacologic attenuation.
- These changes persist for several minutes, risking complications.
- Magnesium sulfate (30 mg/kg IV) given before intubation significantly blunts these effects.
- The greatest impact is observed on blood pressure, with a milder effect on heart rate.

6. Recommendations

- Magnesium sulfate is affordable, available, and effective; it should be considered routine in patients undergoing intubation under general anesthesia, especially those with cardiovascular or neurologic vulnerabilities.
- Further studies are recommended in high-risk populations and in comparison with other agents such as beta-blockers or opioids.
- National guidelines may consider including magnesium sulfate as a standard option for blunting pressor responses during airway manipulation.

7. References

1. 1. Telci L, Esen F, Akcora D, et al. Evaluation of effects of magnesium sulphate in reducing intraoperative anaesthetic requirements. Br J Anaesth. 2002;89(4):594–8.
2. 2. James MF, Beer RE, Esser JD. Intravenous magnesium sulfate inhibits catecholamine release associated with tracheal intubation. Anesth Analg. 1989;68(6):772–6.
3. 3. Goel R, Rani R, Singh OP, et al. Attenuation of cardiovascular responses to laryngoscopy and intubation by various drugs. Hospital Today. 2000;9.
4. 10. Kumar M, Choudhary S, Verma S, et al. Comparative study of magnesium sulfate and dexmedetomidine for attenuation of hemodynamic stress response during laryngoscopy and intubation. Saudi J Anaesth. 2021;15(3):261–267.
5. 11. Goyal R, Rath GP, Bithal PK, et al. Magnesium sulfate and clonidine for attenuation of cardiovascular responses to laryngoscopy and endotracheal intubation: A comparative study. J Anaesthesiol Clin Pharmacol. 2020;36(4):536–541.
6. 12. Forbes AM, Dally FG. Acute hypertension during induction and intubation in normotensive man. Br J Anaesth. 1970;42:618–622.
7. 13. Allen RW, James MFW, Uys PC. Attenuation of the pressure-response to tracheal intubation in hypertensive, proteinuric, pregnant patients. Br J Anaesth. 1991;66:216–223.
8. 14. Donegan MF, Bedford RF. Intravenously administered lignocaine prevents intracranial hypertension during suctioning. Anesthesiology. 1980;52:516–518.
9. 15. Russell WJ, Morris RG, Frewin DB, Drew SE. Changes in plasma catecholamine concentrations during intubation. Br J Anaesth. 1981;53:837–840.
10. 16. Prys-Roberts C, Foëx P, Biro GP, Roberts JG. Adrenergic beta-receptor blockade. Br J Anaesth. 1973;45:671–680.
11. 17. Mikawa K, Nishina K, Maekawa N, Obara H. Comparison of nicardipine, diltiazem and verapamil for controlling the cardiovascular responses to tracheal intubation. Br J Anaesth. 1996;76:221–226.

Efficacy of Magnesium Sulfate in Attenuating the Hemodynamic Response to Laryngoscopy and Endotracheal Intubation

ORIGINALITY REPORT

31%	26%	27%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.worldwidejournals.com Internet Source	4%
2	Senthil Kumar Kaliannan, Khaja Mohideen Sherfudeen, Pavan Kumar Dammalapati. "COMPARISON OF CLONIDINE AND DEXMEDETOMIDINE IN BLUNTING THE CARDIOVASCULAR RESPONSES TO LARYNGOSCOPY AND TRACHEAL INTUBATION- A RANDOMIZED CONTROL STUDY", Journal of Evolution of Medical and Dental Sciences, 2019 Publication	2%
3	isharonline.org Internet Source	2%
4	neuroquantology.com Internet Source	2%
5	pmc.ncbi.nlm.nih.gov Internet Source	2%
6	www.prrs.com Internet Source	2%
7	Submitted to Florida International University Student Paper	1%
8	www.msjonline.org Internet Source	1%

9	Anju Mohan, Gautam Saha. "A comparative study of the efficacy of intravenous magnesium sulphate and intravenous dexmedetomidine in attenuating haemodynamic response to laryngoscopy and endotracheal intubation", Indian Journal of Clinical Anaesthesia, 2023 Publication	1 %
10	Priyanka Shrivastava, Mukesh Kumar, Saket Verma, Ridhima Sharma, Raman Kumar, Ravi Ranjan, Jay Prakash. "Evaluation of Nebulised Dexmedetomidine Given Pre-operatively to Attenuate Hemodynamic Response to Laryngoscopy and Endotracheal Intubation: A Randomised Control Trial", Cureus, 2022 Publication	1 %
11	Ahmed Balata, Howaida Abdel Latif, Salwa Waly, Ahmed Mohamed. "DEXMEDETOMIDINE VERSUS MAGNESIUM SULPHATE OR LIDOCAINE FOR BLUNTING STRESS RESPONSE TO DIRECT LARYNGOSCOPY AND ENDOTRACHEAL INTUBATION IN ABDOMINAL SURGERIES.", Zagazig University Medical Journal, 2018 Publication	1 %
12	ijwph.ir Internet Source	1 %
13	saspublishers.com Internet Source	1 %
14	www.ijss-sn.com Internet Source	1 %
15	Peng-fei Gao, Jing-yan Lin, Shun Wang, Yun-feng Zhang, Guo-qiang Wang, Qi Xu, Xiao Guo.	1 %

	"Application of magnesium sulphate as a " multimodal general anesthesia" protocol in patients undergoing hysteroscopy: a randomized controlled study", Research Square Platform LLC, 2020 Publication	
16	anesthpain.com Internet Source	1 %
17	ijmpr.in Internet Source	1 %
18	journals.lww.com Internet Source	1 %
19	Edza Davis, Vasudeva Upadhyaya K.S., Nischala Dixit. "Comparison of the Efficacy of Palonosetron and Ondansetron in Prevention of Postoperative Nausea and Vomiting", Indian Journal of Anesthesia and Analgesia, 2019 Publication	1 %
20	Alessandro De Cassai, Annalisa Boscolo, Federico Geraldini, Francesco Zarantonello et al. "Effect of dexmedetomidine on hemodynamic responses to tracheal intubation: A meta-analysis with meta-regression and trial sequential analysis.", Journal of Clinical Anesthesia, 2021 Publication	1 %
21	Reddy Mamatha Chikkanarasimha, Rajappa Nulenur Rashmi, Venkataramaiah Vani Nitturu, Bindu Nagaraj, Nagaraja Swathi. "A comparative study of two different doses of magnesium sulfate on pneumoperitoneum-related hemodynamics and on the recovery in	1 %

patients undergoing laparoscopic gynecological surgeries: A double-blind, randomized, clinical study", Asian Journal of Medical Sciences, 2023
Publication

22 Sathya Narayanan Karunanithi, Geeta Bhandari, Kedar Singh Shahi, Aditya Kumar Chauhan, Pooja Gautam. "Comparative Study of IV Esmolol, IV Diltiazem, and IV Lignocaine Hydrochloride in Attenuating Pressure Response to Laryngoscopy and Intubation", Journal of Evolution of Medical and Dental Sciences, 2020 1%
Publication

Exclude quotes	On	Exclude matches	Off
Exclude bibliography	On		