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Comparision of intravenous magnesium sulphate and lignocaine in attenuation of pressor response to laryngoscopy and endotracheal intubation

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Abstract
Endotracheal intubation and laryngoscopy are noxious stimuli and provoke cardiovascular and autonomic responses because of sympathoadrenal stimulation. Attenuation of significant increases in heart rate and blood pressure decreases the risk of complications.
Various pharmacological and non-pharmacological methods have been tried to attenuate hemodynamic response to laryngoscopy and endotracheal intubation. None of the approaches have proved to be ideal.
In view of it present study was undertaken to evaluate and compare effects of intravenous magnesium sulphate 30mg/kg and lignocaine 2mg/kg in attenuation of pressor response to laryngoscopy and endotracheal intubation.
Prospective randomized controlled study was conducted in which 60 American society of Anesthesiologist 1 patients, aged 18-60yrs, undergoing elective surgery under general anesthesia were selected. Patients were randomized into 2 groups: Group 1 with thirty patients who received MgSO4 30mg/kg and Group 2 with thirty patients who received lignocaine 2 mg/kg intravenous bolus. Anesthesia was induced using premedication glycopyrolate, midazolam, ondansetron injection Fentanyl was administered as analgesic agent. Study drug Injection mgso4 was administered 90sec before induction with injection propofol as induction agent followed by injection succinylscoline to facilitate intubation. Laryngoscopy and intubation response in both groups were studied by recording Heart Rate (HR), blood pressure (BP), at baseline ,after administering drug, at laryngoscopy, after intubation, 1min ,3min,5minsafter intubation.
Study revealed that Group 1 patients had significant decreasing trend in HR and MAP recorded till 5mins after intubation. Mgso4 has vasodilator properties and significantly suppresses release of catecholamines and hence can attenuate stress response to laryngoscopy and endotracheal intubation better than lignocaine.

Keywords: Laryngoscopy, endotracheal intubation, cardiovascular response, magnesium sulphate, lignocaine

Introduction
Direct laryngoscopy and endotracheal intubation following induction of anesthesia is almost always associated with hemodynamic changes due to reflex sympathetic discharge caused by laryngopharyngeal stimulation [1] and catecholamine release. This increased sympathoadrenal activity may result in hypertension, tachycardia, increased myocardial oxygen demand [2, 3, 4] which is detrimental in comorbid patients. The non-pharmacologoical methods like smooth and gentle intubation with a shorter duration of laryngoscopy, insertion of LMA in place of endotracheal intubation [5] and blocking Glossopharyngeal and superior laryngeal nerves [6] have been used to attenuate the cardiovascular response to laryngoscopy and endotracheal intubation.
Pharmacological methods such as topical and intravenous lignocaine; sympatholytic drugs like phentolamine, narcotic agents like nalbuphine; fentanyl and alfentanil; beta blockers like intravenous labetalol, metoprolol and esmolol; alpha adrenergic blocking drugs like oral and intravenous clonidine; vasodilators like nitrogycerine and hydralazine; calcium channel blockers like diltiazem; alpha 2 agonist clonidine and dexmedetomidine have been tried.
Magnesium has been described as the physiological calcium antagonist [7], highly effective arteriolar vasodilator [8, 9, 10], inhibits catecholamine release from adrenal gland, sympatholytic, analgesic and sedative thus proving effective to blunt pressor response.

Intravenous lignocaine has been used to suppress cough during tracheal intubation [11] and decrease the incidence of cough during extubation and postoperative sore throat [12]. Supress airway hyperreactivity and mitigate bronchoconstriction following intubation [13]. Intravenous lignocaine with its centrally depressant and antiarrythmic effect was found to be suitable alternative to minimize pressor response.

Aim: To compare efficacy of intravenous magnesium sulphate (30mg/kg) and intravenous lignocaine (2mg/kg) in attenuating stress response to laryngoscopy and endotracheal intubation.

Objectives: To observe the effect on HR, BP.
To assess any complications.

Materials and Methods

This study was carried out in Department of Anesthesiology, Smt Kashibai Navale Medical College and GH, Narhe, Pune, Maharashtra, India.
During preanesthetic Check-up all patients were explained about study purpose, procedure, risks, advantages of procedure. A written informed consent was taken prior to day of surgery.

Study design: Prospective randomised control study. Ethical committee clearance was obtained prior to the study.

Study period: From September 2020 to December 2021(18months)

Sample size: Total 60 patients aged between 18-60yrs admitted in surgery, orthopaedic, ENT ward for elective surgeries.
The subjects were selected by computer generated randomised table and divided into 2 groups of 30 each. Group 1 received Magnesium sulphate intravenous 30mg/kg, Group 2 received lignocaine intravenous 2mg/kg. Both were given 90 seconds prior induction.

Inclusion criteria

1. ASA GRADE 1 and 2
2. AGE -18-60yrs
3. Patients scheduled for emergency or elective surgeries under GA

Exclusion criteria

a) Patients below 18 yrs. and above 60 yrs. of age.
b) Belonging to American society of anesthesiologist Grade 3 or more
c) Patients with anticipated difficult airway.

Procedure

Routine preanesthetic checkup assessing :General condition of patient, airway by Mallampatti grading, nutritional status, body weight, detailed examination of cardiovascular and respiratory system and baseline investigations: Complete hemogram, random blood sugar, renal function tests, liver function tests, PT/INR, electrocardiogram, chest xray, was done before surgery. All patients were kept nil per orally 10pm onwards on previous night. On arrival to operation theatre, adequate fasting status was confirmed. Baseline systolic, diastolic blood pressure, Mean arterial pressure and heart rate was recorded. Patients taken inside OT, all monitors including ECG, BP, Pulse oximeter was attached and patients preloaded with 10ml/kg Ringers lactate solution. The cardiac rate and rhythm were also monitored from continuous visual display of electrocardiogram from lead II. All patients were pre-medicated with intravenous Glycopyrrolate 4mcg/kg, Midazolam 0.03mg/kg, ondansetron 0.08mg/kg, injection fentanyl 2mcg/kg as routine opiod premedication. The patients were pre-oxygenated for 3min with 100% oxygen. Patients were divided into two groups of 30 each. Group 1 received Magnesium sulphate intravenous 30mg/kg diluted in 100ml normal saline slowly. Group 2 received lignocaine 2mg/kg intravenously. Both drugs were given 90seconds prior induction. Induction was done with inj. Propofol 2mg/kg and after confirmation of adequacy of mask ventilation endotracheal intubation was facilitated with inj. succinylcholine 1.5mg/kg. Laryngoscopy was performed using Macintosh laryngoscope, under visualation of vocal cords cuffed endotracheal tube of appropriate size was passed. After confirming bilateral equal air entry, the endotracheal tube was secured. Anaesthesia was maintained using 50% nitrous oxide and 50% oxygen with sevoflurane and inj. vecuronium. No surgical or any other stimulus was applied during study period. At the end of procedure patients were reversed with neostigmine 0.05mg/kg and glycopyrolate 8mcg/kg. Hemodynamic parameters of patient including systolic, diastolic blood pressure, mean arterial pressure and heart rate (HR) were recorded as: Baseline, after drug administration, at laryngoscopy, after intubation, 1, 3, 5 minutes after intubation. All patients were observed for any side effects like hypotension, bradycardia, postoperative sedation, prolongation of neuromuscular blocking drugs.

Results

Heart Rate Variations

Table 1: Comparision of Heart Rate Variation

Time interval	Magnesium sulphate group-1(n=30) (Mean +/-SD)	Lignocaine group Group-2(n=30) (mean +/-sd)	p-value
Baseline	80.4 ± 11.18	84.23±11.11	0.20
After drug administration	78.73 ± 9.40	84 ± 10	0.16
At laryngoscopy	80.73 ±11.87	86± 0.6	0.07
After intubation	78.16 ± 10.39	82 ± 8.5	0.122
1min after intubation	76.93+/-2.95	80.40+/-4.2	0.0005
3 min after intubation	74.98+/-9.88	79.87+/-4.5	0.015
5min after intubation	72.93+/-2.73	78+/-10.9	0.017

Statistically significant reduction in heart rate was seen (p-value<0.05) at 1, 3, 5 minutes after intubation in group 1 as compared to group 2.

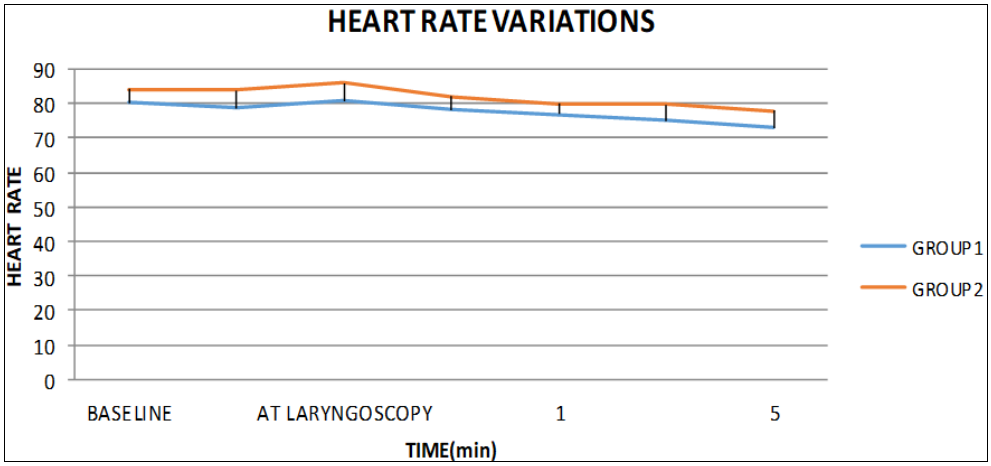

Fig 1: Line diagram showing mean heart rate variations

Systolic blood pressure variations

Table 2: Comparision of Systolic Blood Pressure variations between Group 1 and 2

Time Interval	Magnesium sulphate Group-1 (N=30) (Mean ± SD)	Lignocaine GROUP-2 (N=30) (Mean ± SD)	P value
Baseline	126.06+/-11.41	123.78+/-12.67	0.46
After drug administration	122.5+/-17.61	122.46+/-16.22	0.98
At laryngoscopy	118.03 ± 13.71	122.43 ± 17.13	0.27
After intubation	112.2 ± 11.00	115.56 ± 13.96	0.30
1 min after intubation	108.66 ± 10.87	110.73 ± 12.03	0.48
3 min after intubation	106.2+/-5	110±7.2	0.02
5 min after intubation	100.8±4	112±6.6	0.0001

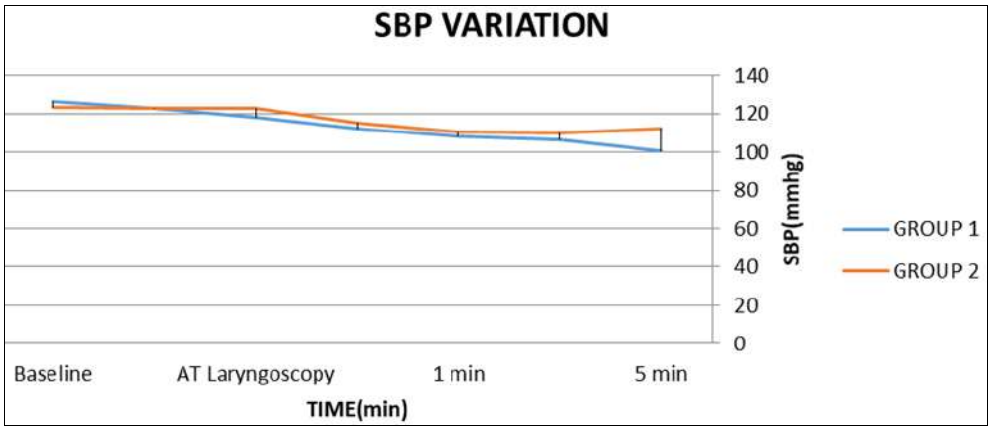

Fig 2: Line diagram showing mean systolic blood pressure variations

Statistically significant reduction in systolic blood pressure occurred in group1 as compared with group II at 3 and 5 minutes after endotracheal intubation.

Diastolic blood pressure variations

Table 3: Comparision of Diastolic Blood Pressure variations

Time Interval	Magnesium sulphate Group I (N=30) (Mean ± SD)	LIGNOCAINE GROUP II (N=30) (Mean ± SD)	P value
Baseline	78.6 ± 8.46	78.83 ± 9.53	0.92
After drug administration	74.73±10.09	78.53 ± 14.07	0.23
At laryngoscopy	72.26 ± 10.19	78.83 ± 10.29	0.55
After intubation	69.36 ± 9.83	70.2 ± 9.61	0.74
1min after intubation	66.16 ± 8.78	66.36 ± 8.96	0.93
3 min	64.73±6.5	66±5.3	0.4
5 min	63.73±5.2	64.4±4.7	0.9

Significant reduction in diastolic blood pressure is observed in patients in both groups.

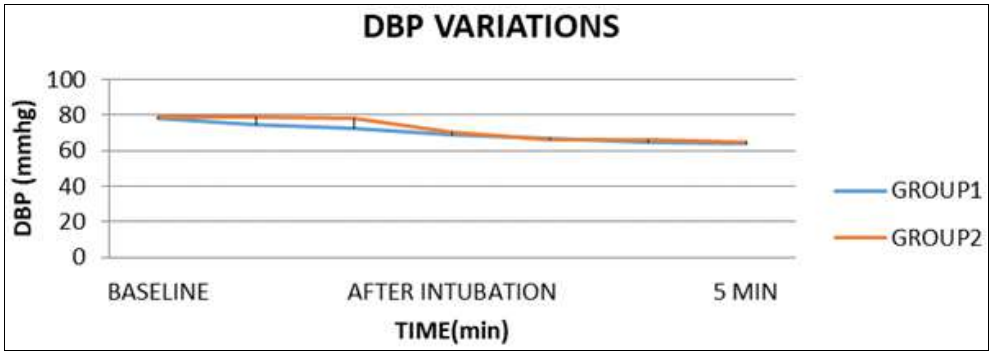

Fig 3: Line diagram showing Mean Diastolic Blood Pressure variations

Mean Arterial Pressure Variations

Table 4: Comparision of Mean Arterial Pressure Variation

Time Interval	Magnesium sulphate Group (N=30) (Mean ± SD)	Lignocaine Group (N=30) (Mean ± SD)	P value
Baseline	95.2 ± 11.32	94.73 ± 10.28	0.86
After drug administration	91.08 ± 12.27	94.06 ± 14.96	0.52
At laryngoscopy	92.4±13.0	95.62±10,66	0.28
After intubation	90.25±11.5	94.17±12	0.26
1 min	90.0±10	94.25±11.4	0.13
3 min	89.3 ± 11.21	89.63 ± 12.07	0.91
5 min	84.53 ±9.17	85.26 ± 10.65	0.77

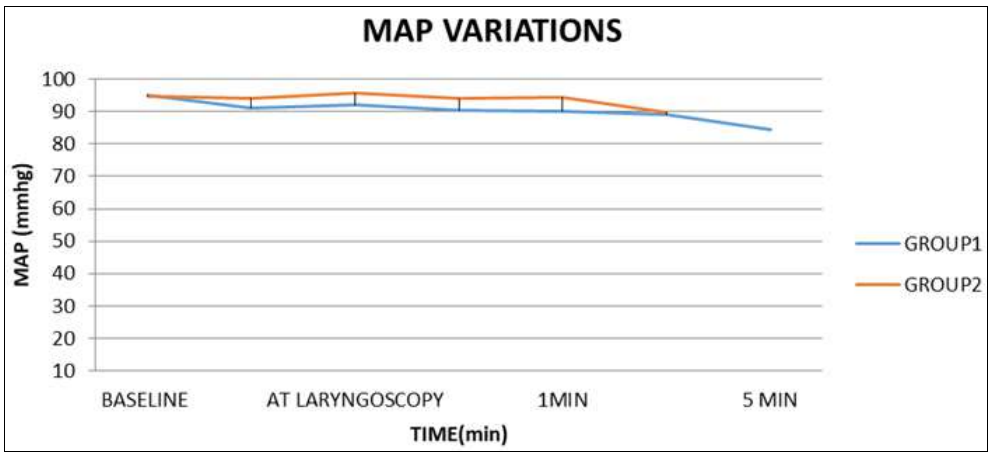

Fig 4: Line diagram showing Mean MAP variations Mean arterial pressure reduction is seen in both groups 1, 3, 5 mins after intubation.

Discussion

The frequent occurrence of cardiovascular reactions to laryngoscopy and endotracheal intubation has attracted attention of anesthesiologists due its association with tachycardia, hypertension. Burstein et al found that pressor response was due to augmented sympathetic response provoked by stimulation of epipharynx and laryngopharynx. The cardiovascular response is a reflex phenomenon. This is mediated by vagus (X) and Glossopharyngeal (IX) cranial nerves. Vagus and Glossopharyngeal nerves carry the afferent stimulus from epiglottis and infraglottic region and activate the vasomotor centre to cause a peripheral sympathetic adrenal response to release adrenaline and noradrenaline **[14]**. Several techniques have been employed to modify theses pressor response. None of these entirely block response and may themselves carry additional risks, long acting and have their own side effects. Deep inhalational agents has been used to modify response at central nervous system level but cannot be used in critically ill patients with diminished cardiac reserve. Opiods cause respiratory depression, chest wall rigidity and prolong recovery time [15], nitroprusside [16] causes reflex tachycardia, beta blockers, calcium channel blockers, local anesthetics like lignocaine are also effective in controlling hemodynamics during laryngoscopy and endotracheal intubation. Magnesium sulphate is upcoming agent found to be effective in attenuation of pressor response.

Various authors have employed IV Magnesium Sulphate and lignocaine for the attenuation of hemodynamic response to endotracheal intubation in various doses and methods of administration.

Mechanisms explained for action of MGSO4 and its desirable properties are as follows.

1. Dose dependent presynaptic inhibition of neurotransmitter release [17].
2. Physiological and pharmacological blocker of NMDA receptors in neuronal tissues [18].
3. Smooth muscle relaxation, peripheral vasodilation [19] and decreases Systemic vascular resistance thus provide hemodynamic stability [19].
4. Inhibition of release of catecholamines [21] from adrenal medulla and adrenergic nerve terminals

5. Cough suppressing property due to smooth muscle relaxation
6. Antiarrythmic properties
7. Reduction in anesthetic requirements of volatile agents and muscle relaxants [20, 22].
8. Analgesic properties [23]
9. Maintain hypotensive anesthesia.
10. Stops post-anesthetic shivering [24]

Adverse effects such as postoperative sedation, respiratory depression, severe hypotension, bradycardia were apparent in 2 or 3 patients. Magnesium prolongs and potentiates neuromuscular block by non-depolarizing neuromuscular blocking agents [25].
Serum magnesium concentration of 2.5-5mmol/lit can result in toxicity.

Cardiac arrest occurs at 12.5 mmol litre [26]

1. Lakshmi mahajan et al performed a study in 2018, Attenuation of the pressor responses to laryngoscopy and endotracheal intubation with intravenous dexmedetomidine versus magnesium sulphate under bispectral index-controlled anaesthesia**,** placebo-controlled prospective randomized trial and concluded magnesium sulphate significantly reduced heart rate from baseline.
2. Azim Honarmand et al performed a study in 2015, Different doses of intravenous Magnesium sulfate on cardiovascular changes following the laryngoscopy and tracheal intubation: A double-blind randomized controlled trial. They concluded that, the use of $MgSO_4$ in doses less than 50 mg/kg can be effective to reduce cardiovascular instability related to laryngoscopy and tracheal intubation.
3. Manish B. Kotwani, Deepti M. Kotwani et al conducted a study in 2016, a comparative study of two doses of magnesium sulphate in attenuating haemodynamic responses to laryngoscopy and intubation and concluded that intravenous magnesium sulphate successfully attenuates hemodynamic changes during laryngoscopy and intubation.
4. Nikhil S Bhalerao et al conducted a study in 2017, Comparison between magnesium sulfate (50 mg/kg) and lignocaine (2 mg/kg) for attenuation of intubation response in hypertensive patients. Finally they concluded that, Magnesium sulfate 50 mg/kg has a better control of BP during intubation in hypertensive patients with some incidence of hypotension when compared with lignocaine 2 mg/kg.

With all advantages and minimal side effects present study was carried out to evaluate and compare efficacy of intravenous magnesium sulphate and lignocaine in blunting hemodynamic response to laryngoscopy and endotracheal intubation.

Hemodynamic variations

Heart rate

Sachin Padmawar et al in 2016 found in their study that Heart rate being better controlled in magnesium sulphate group as compared to lignocaine group.
RW. Allen, M.F.M. JAMES et al in their study found that in heart rate control magnesium sulphate group is more effective than lignocaine group.
Our study results showed that Heart rate was controlled in both groups but was better controlled in magnesium sulphate group.

Blood pressure

Nikhil. S. Bhalerao et al in 2017 found Magnesium sulfate has a better control of BP during intubation when compared with lignocaine.
Navid Nooraei ME, Dehkordi BR, et al in 2013 found that Magnesium sulphate is more effective than lidocaine in controlling hemodynamics.
Our study showed that both groups were effective for controlling systolic, diastolic and mean arterial pressure but Magnesium sulphate was more effective.

Conclusion

Magnesium Sulphate provides fairly good and sustained control over hemodynamic responses to stress of latyngoscopy and intubation and is significantly better than lignocaine. It also provides hypotensive anesthesia, lesser requirements of anesthetic agents and analgesia.

Conflict of Interest
Not available

Financial Support
Not available

References

1. Shribman AJ, Smith G, Achola KJ. Cardiovascular and catecholamine responses to laryngoscopy with and without tracheal intubation: Br. J Anaesth. 1987;59:295-299
2. Burstein CL. Electrocardiographic studies during endotracheal intubation. I. Effects during usual routine technics. Anesthesiology. 1950;11:224
3. Stoelting RK. Blood pressure and heart rate changes during short-duration laryngoscopy for tracheal intubation anesthesia analgesia; 1978.
4. Prys-Roberts C. Studies of anaesthesia in relation to hypertension. II. Haemodynamic consequences of induction and endotracheal intubation. Indian journal of anesthesia; 1971.
5. Jarineshin H, Kashani S, Vatankhah M, Abdulahzade Baghaee A, Sattari S, Fekrat F. Better Hemodynamic Profile of Laryngeal Mask Airway Insertion Compared to Laryngoscopy and Tracheal Intubation. Iran Red Crescent Med J. 2015 Aug 12;17(8):e28615. doi: 10.5812/ircmj.28615. PMID: 26430529; PMCID: PMC4587401.
6. Abeer Ahmed Dalia Saad Abdel Rahman Youness Superior laryngeal nerve block as an adjuvant to General Anesthesia during endoscopic laryngeal surgeries: A randomized controlled trial Egyptian Journal of Anaesthesia. 2015;31(2):167-177.
7. James MF, Beer RE, Esser JD. Intravenous magnesium sulfate inhibits catecholamine release associated with tracheal intubation. Anesth Analg. 1989;68:772-776. [Crossref]
8. Kimura T, Yasue H, Sakaino N, et al. Effects of magnesium on the tone of isolated human coronary arteries: comparison with diltiazem and nitroglycerin. Circulation. 1989;79:1118-24. PubMed | CrossRef
9. Miyagi H, Yasue H, Okumura K, et al. Effect of

magnesium on anginal attack induced by hyperventilation in patients with variant angina. Circulation. 1989;79:597-602 PubMed | CrossRef
10. Vigoriti C, Giordano A, Ferraro P, et al. Hemodynamic effects of magnesium sulfate on the normal human heart. Am J Cardiol. 1991;67:1435-7. PubMed | CrossRef.
11. Yukioka, Hidekazu MD, Hayashi, Masanori MD, Terai, Takekazu MD, Fujimori Mitsugu MD. Intravenous Lidocaine as a Suppressant of Coughing During Tracheal Intubation in Elderly Patients. Anesthesia & Analgesia. 1993;77(2):309-312.
12. British journal of anesthesia Respiration and the airway Intravenous lidocaine to prevent postoperative airway complications in adults: a systematic review and meta-analysis Stephen S. Yang1, *, Ning-Nan Wang1, Tatyana Postonogova1 , Grace J. Yang2 , Michael McGillion3 , Francois Beique1 and Thomas Schricker. 2020;124(3):314e323.
13. Groeben, Harald, Silvanus, Marie-Theres, Beste, Meg, Peters, Juergen. Both Intravenous and Inhaled Lidocaine Attenuate Reflex Bronchoconstriction but at Different Plasma Concentrations. American journal of respiratory and critical care medicine. 1999;159:530-5. 10.1164/ajrccm.159.2.9806102.
14. Thakur D, Chauhan NS, Ramchandani R, Shah H. Attenuation of Haemodynamic Responseduring Laryngoscopic Intubation with Fentanyl. Natl J Med Res. 2016;6(4):309-12. [Google Scholar]
15. Abou-Arab MH, Heier T, Caldwell JE. Dose of alfentanil needed to obtain optimal intubation conditions during rapid-sequence induction of anaesthesia with thiopentone and rocuronium Br J Anaesth. 2007;98:604–10. | PubMed | CrossRef
16. Powroznyk A, Vuylsteke A, Naughton C, Misso S, Holloway J, Jolin-Mellgard A, et al Comparison of clevidipine with sodium nitroprusside in the control of blood pressure after coronary artery surgery Eur J Anaesth. 2003;20:697–7. PubMed | CrossRef
17. James MF, Beer RE, Esser JD. Intravenous magnesium sulfate inhibits catecholamine release associated with tracheal intubation. Anesth Analg. 1989;68:772–6. [PubMed] [Google Scholar]
18. Mayer ML, Westbrook G, Guthrie PB. Voltage-dependent block by Mg^{2+} of NMDA responses in spinal cord neurons, Nature. 1984;309:261-3. GoogleScholarCrossrefPubMed
19. Altura BM, Altura BT. Magnesium and vascular tone and reactivity. Blood Vessels. 1978;15:5–16. [PubMed] [Google Scholar]
20. Ryu JH, Kang MH, Park KS, Do SH. Effects of magnesium sulphate on intraoperative anaesthetic requirements and postoperative analgesia in gynaecology patients receiving total intravenous anaesthesia. Br J Anaesth. 2008;100:397-403. [PubMed] [Google Scholar]
21. James MF, Beer RE, Esser JD. Intravenous magnesium sulfate inhibits catecholamine release associated with tracheal intubation. Anesth Analg. 1989;68:772-6. [PubMed] [Google Scholar]
22. Telci L, Esen F, Akcora D, Erden T, Canbolat AT, Akpir K. Evaluation of effects of magnesium sulphate in reducing intraoperative anaesthetic requirements. British journal of anaesthesia. 2002 Oct 1;89(4):594-8.
23. Tramer MR, Schneider J, Marti RA, Rifat K. Role of magnesium sulfate in postoperative analgesia, Anesthesiology. 1996;84:340-7
24. Magnesium Sulfate Stops Postanesthetic Shivering[a] S Kizilirmak, ŞE Karakaş, - Annals of the New, Wiley Online Library; c1997.
25. Kussman B, Shorten G, Uppington J, *et al.* Administration of magnesium sulfate before rocurinium: Effects on speed of onset and duration of neuromuscular block Br J Anaesth. 1997;79:122-124.
26. Vissers RJ, Purssell R. Iatrogenic magnesium overdose: two case reports J Emerg Med. 1996;14:187-191.

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