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A Comparative Study between Magnesium Sulphate and Dexmedetomidine for Attenuation of Vasopressor Stress Response During Laryngoscopy and Endotracheal Intubation

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ABSTRACT

Background: Laryngoscopy and intubation, being noxious stimuli, incite remarkable sympathetic activity. The present study compared magnesium sulphate and dexmedetomidine for attenuation of vasopressor stress response during laryngoscopy and endotracheal intubation. **Methods:** The present study was conducted on 90 patients of American Society of Anesthesiologists (ASA physical status I and II, aged 18–60 years, of either sex. Patients were divided into three groups of 30 each. Group I was administered IV dexmedetomidine 1 µg/kg, group II received IV magnesium sulphate 30 mg/kg and group III was control group, received normal saline intravenously. Heart rate (HR), systolic blood pressure (SBP) and diastolic blood pressure (DBP) were recorded pre-drug, after drug, at intubation, at intervals of 1 min till 5 min, then every 2 min till 10 min and every 10 min for 30 min. **Results:** The mean weight in group I was 69.2 Kg, in group II was 67.4 and in group III was 72.5. ASA status I was seen in 22 in group I, 20 in group II and 18 in group III and status II was seen in 8 in group I, 10 in group II and 12 in group III. Duration of surgery was 101.4 minutes in group I, 102.5 minutes in group II and 103.8 minutes in group III. In group I and II heart rate decreased upto 4 minutes and later on started increasing till 10 minutes and then decreased upto 30 minutes. In group III, mean heart rate increased till 7 minutes then started decreasing till 30 minutes. The mean systolic blood pressure (SBP) decreased pre- operatively till 5 minutes in all groups and then started increasing but not crossed 1st value. The mean SBP was higher in group III ($P< 0.05$). In group I and II, DBP decreased till 4 minutes and then started increasing till 30 minutes whereas I group III, it increased till 2 minutes then decreased till 30 minutes. The difference was significant ($P< 0.05$). **Conclusion:** Authors found that magnesium sulphate and dexmedetomidine significantly reduced the heart rate and blood pressure from baseline.

Keywords: Dexmedetomidine, heart rate, magnesium sulphate.

INTRODUCTION

Laryngoscopy and intubation, being noxious stimuli, incite remarkable sympathetic activity. The pressor response, represented by an abrupt rise in the arterial blood pressure and heart rate (HR), arising 30 seconds after laryngoscopy and intubation, returns to baseline values steadily within 5–10 min.[1] These transitory responses usually produce no consequences in healthy individuals but may be harmful to the patients having reactive airways, hypertension, coronary artery disease, myocardial insufficiency and cerebrovascular diseases.[2]

Magnesium Sulphate (MgSO4) is well known to block the release of catecholamine from both adrenergic nerve terminals and the adrenal gland. Moreover, Magnesium produces vasodilator effect by acting directly on blood vessels, and high-dose Magnesium attenuates vasopressin-stimulated vasoconstriction.[3] Magnesium also exerts its analgesic action as a non-competitive NMDA receptor antagonist, blocking ion channels in a voltage dependent manner. Intravenous (IV) magnesium sulphate has also been shown to reduce the haemodynamic changes associated with laryngoscopy and intubation.[4]

Dexmedetomidine is known to attenuate hypertensive responses associated with intubation, surgical stimulation and emergence.[5] Dexmedetomidine, being a more selective α2 receptor agonist, decreases catecholamine by 90% and causes fall in the heart rate and blood pressure along with decreased systemic vascular resistance and cardiac output.[6] It increases the hemodynamic stability, and decreases anesthetic requirements and postoperative analgesic requirements.[7] The present study compared magnesium sulphate and dexmedetomidine for attenuation of vasopressor stress response during laryngoscopy and endotracheal intubation.

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MATERIALS AND METHODS

The present study was conducted in the department of Anesthesiology. It consisted of 90 patients of American Society of Anesthesiologists (ASA physical status I and II, aged 18–60 years, of either

sex. Informed written consent was obtained from all patients.

Data such as name, age, gender etc. was recorded. Pre-anaesthetic evaluation was performed.

Patients were divided into three groups of 30 each. Group I was administered IV dexmedetomidine 1 µg/kg, group II received IV magnesium sulphate 30 mg/kg and group III was control group, received normal saline intravenously. IV glycopyrrolate 0.01 mg/kg and butorphanol 0.02 mg/kg were given to all patients. After achieving BIS 40–50 (±5), laryngoscopy and intubation were performed. Heart rate (HR), systolic blood pressure (SBP) and diastolic blood pressure (DBP) were recorded pre-drug, after drug, at intubation, at intervals of 1 min till 5 min, then every 2 min till 10 min and every 10 min for 30 min. Results were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table 1: Demographic characteristics

Parameters	Group I	Group II	Group III
Weight (Kg)	69.2	67.4	72.5
ASA (I:II)	22:8	20:10	18:12
Duration of surgery (minutes)	101.4	102.5	103.8

[Table 1] shows that mean weight in group I was 69.2 Kg, in group II was 67.4 and in group III was 72.5. ASA status I was seen in 22 in group I, 20 in group II and 18 in group III and status II was seen in 8 in group I, 10 in group II and 12 in group III. Duration of surgery was 101.4 minutes in group I, 102.5 minutes in group II and 103.8 minutes in group III.

Table 2: Pre- operative and intraoperative heart rate in all groups

Heart rate beats/min	Group I	Group II	Group III
Pre	90	92	84
After	82	88	86
1 min	70	86	88
2 min	72	80	90
3 min	72	78	92
4 min	74	76	94
5 min	75	74	98
7 min	76	76	100
9 min	78	78	94
10 min	79	76	96
20 min	80	78	94
30 min	82	80	92

[Table 2] shows that in group I and II heart rate decreased upto 4 minutes and later on started increasing till 10 minutes and then decreased upto 30 minutes. In group III, mean heart rate increased till 7 minutes then started decreasing till 30 minutes. The difference was significant (P< 0.05).

[Table 3] shows that mean systolic blood pressure (SBP) decreased pre- operatively till 5 minutes in all groups and then started increasing but not crossed 1st value. The mean SBP was higher in group III (P< 0.05).

Table 3: Pre- operative and intraoperative SBP in all groups

SBP mm Hg	Group I	Group II	Group III
Pre	128	130	132
After	120	128	130
1 min	116	120	130
2 min	114	118	128
3 min	112	116	126
4 min	110	112	122
5 min	114	116	120
7 min	116	118	120
9 min	118	120	122
10 min	122	124	124
20 min	124	126	130
30 min	124	126	130

Table 4: ?

DBP mm Hg	Group I	Group II	Group III
Pre	82	84	82
After	78	82	82
1 min	76	80	84
2 min	68	76	86
3 min	68	74	84
4 min	70	72	82
5 min	72	72	80
7 min	74	74	78
9 min	76	76	76
10 min	78	78	78
20 min	80	80	80
30 min	80	80	82

[Table 4] shows that in group I and II, DBP decreased till 4 minutes and then started increasing till 30 minutes whereas I group III, it increased till 2 minutes then decreased till 30 minutes. The difference was significant (P< 0.05).

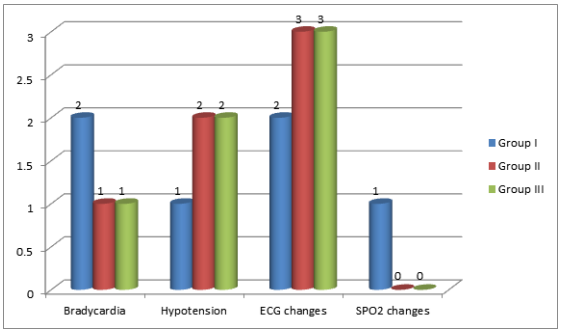

Figure 1: Complications in all groups

[Figure 1] shows that common complication was bradycardia seen 2 in group I, 1 in both group I and II, hypotension 2 in group II and III and 1 in group I, ECG changes 2 in group I, 3 each in group II and III and SPo2 changes 1 in group I only.

DISCUSSION

It is seen that common factors precipitating the pressor response to laryngoscopy and intubation are light planes of anaesthesia, prolonged time for the

procedure, elevation of vagally innervated posterior part of epiglottis by straight/Miller blade, anatomically difficult view, greater force used to displace the tongue and more manipulations/attempts at laryngoscopy and intubation.[8,9] Several drugs and manoeuvres have been used for mitigating this stress response with variable benefits and side effects.[10] The present study compared magnesium sulphate and dexmedetomidine for attenuation of vasopressor stress response during laryngoscopy and endotracheal intubation.

We found that mean weight in group I was 69.2 Kg, in group II was 67.4 and in group III was 72.5. ASA status I was seen in 22 in group I, 20 in group II and 18 in group III and status II was seen in 8 in group I, 10 in group II and 12 in group III. Duration of surgery was 101.4 minutes in group I, 102.5 minutes in group II and 103.8 minutes in group III. Soundarya et al,[11] compared effectiveness of intravenous Magnesium sulphate and Dexmedetomidine in suppressing the cardiovascular stress response in 60 patients which were divided in to two groups of 30 patients each. Group-M received 30mg/kg of Magnesium sulphate and Group-D received 1 mcg/kg Dexmedetomidine ten minutes before intubation. Both the groups were observed for changes in hemodynamic parameters i.e. heart rate (HR) systolic and diastolic blood pressure ,mean rterial blood pressure at 0, 1, 3, 5, 10 minutes post intubation and level of sedation during recovery using ramsay sedation score scale and for adverse effects. It was observed that both magnesium sulphate and dexmedetomidine attenuated the rise in systolic, diastolic blood pressure and mean arterial blood pressure, but magnesium failed to attenuate increase in the heart rate which is less than 10 beats/ min. Sedation score was statistically significant in dexmedetomidine group compared to magnesium group.

We found that in group I and II heart rate decreased upto 4 minutes and later on started increasing till 10 minutes and then decreased upto 30 minutes. In group III, mean heart rate increased till 7 minutes then started decreasing till 30 minutes. The mean systolic blood pressure (SBP) decreased pre-operatively till 5 minutes in all groups and then started increasing but not crossed 1st value. The mean SBP was higher in group III ($P< 0.05$). Mahajan et al,[12] found that 120 patients were randomized to receive either dexmedetomidine 1 µg/kg (Group DS), magnesium sulphate 30 mg/kg diluted in 100 ml saline (Group MS) or 100 ml normal saline (Group NS) 15 min before induction of anaesthesia in a double blind manner. After achieving BIS 40–50 (±5), laryngoscopy and intubation were performed. Heart rate (HR), systolic blood pressure (SBP) and diastolic blood pressure (DBP) were recorded pre-drug, after drug, at intubation, at intervals of 1 min till 5 min, then every 2 min till 10 min and every 10 min for 30 min. SBP, DBP and HR fell in the DS and MS groups. No significant changes in BP were seen in the NS group at induction and after intubation. HR rose in the NS group ($P < 0.001$) at induction from 86.35 ± 9.05 to 95.35 ± 11.60 at 2 min. Patients in DS and MS groups had significantly lower HR, SBP and DBP at laryngoscopy and intubation.

We observed that common complication was bradycardia seen 2 in group I, 1 in both group I and II, hypotension 2 in group II and III and 1 in group I, ECG changes 2 in group I, 3 each in group II and III and SPo2 changes 1 in group I only.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that magnesium sulphate and dexmedetomidine significantly reduced the heart rate and blood pressure from baseline.

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