

A Double Blind Comparative Study of Efficacy of Intravenous Magnesium Sulphate with Lignocaine and Intravenous Clonidine with Lignocaine in Attenuating Hemodynamic Response to Laryngoscopy and Tracheal Intubation during General Anaesthesia

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ABSTRACT:

Background and objectives: Laryngoscopy and tracheal intubation is invariably associated with a reflex sympathetic pressor response resulting in elevated heart rate and blood pressures. This may prove detrimental in high risk patients. The main objectives of the present study are: To study the effect of intravenous magnesium sulphate 30 mg/kg with intravenous lignocaine 1.5mg/kg, and intravenous clonidine 3mcg/kg with intravenous lignocaine 1.5mg/kg on changes in the Systolic blood pressure (SBP), Diastolic blood pressure (DBP) and Mean arterial blood pressure (MAP) during laryngoscopy and intubation under general anesthesia.

Methods: 60 ASA I and II status normotensive patients scheduled for elective surgical Procedures were selected randomly and divided into three groups of 20 each. All patients received premedication with study drug. Induction of anesthesia was standardized for all patients who received, thiopentone 5 mg/kg i.v. and preservative free lignocaine 1.5mg i.v and were relaxed with succinylcholine 2mg/kg i.v. and laryngoscopy and intubation is done with appropriate sized endotracheal tube. HR, systolic, diastolic blood pressure were recorded noninvasively before induction, postintubation, 1,3,5,7 and 10 minutes from the onset of laryngoscopy. 'z' test was used for statistical analysis.

Results: The basal and pre laryngoscopy mean SBP and standard deviations in CL group were 122.15 +/- 8.12 and 114.50 +/- 7.30 respectively. In ML group basal systolic blood pressure was 117.30 +/- 9.78. After giving study drug prelaryngoscopy SBP decreased by 3mm of mm Hg to 114.15 +/- 15.26.

Conclusion: Both study drugs were more effective in attenuation of pressor response to intubation than when lignocaine alone was used

Key words: Attenuation, Pressor response, Laryngoscopy, Intubation, Lignocaine, Magnesium sulphate, Clonidines

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INTRODUCTION

Hypertension and tachycardia during intubation under general anaesthesia have been reported since 1950^{1,2}. Increase in blood pressure and heart rate occurs most commonly from reflex sympathetic discharge in response to laryngotracheal stimulation, which in turn leads to increased plasma norepinephrine concentration³. These changes may be associated with morbidity and mortality in patients with heart disease and hypertension, provoking complications like bleeding, increased intracranial and intraocular pressure.

There are various techniques by which this intubation-related stress response can be attenuated, all of which depend on reduction in input stimuli or the

blockade of adrenergic responses e.g. deep anaesthesia, topical anaesthesia, use of ganglionic blockers, beta blockers⁴, antihypertensive agents like phentolamine⁵, Sodium nitroprusside, nitroglycerine⁶ and calcium channel blockers^{7,8}. Intravenous magnesium sulphate inhibits catecholamine release associated with tracheal intubation and produces vasodilation by directly acting on blood vessels⁹.

Clonidine, α_2 adrenoreceptor agonist attenuates adrenergic haemodynamic stress response¹⁰. It is effective in attenuating increase in heart rate and mean arterial pressure during endotracheal intubation¹¹. Intravenous preservative free lignocaine with its well established centrally depressant and anti-arrhythmic effect is a more popular method to minimize this pressor response^{12,13}. This drug is used routinely for general anaesthesia cases in our institution. In spite of so many studies, so far not many studies have been published for comparing the efficacy of combination of drugs. Hence the present study was undertaken to compare advantages and efficacy of combining intravenous magnesium sulphate with intravenous lignocaine, and intravenous clonidine with intravenous lignocaine on blunting haemodynamic responses

endotracheal intubation during general anaesthesia in our institution.

Methodology:

A clinical double blind comparative study of attenuation of hemodynamic response to laryngoscopy and intubation was done in 60 patients of 15-50 years of age scheduled to undergo elective surgery under general anesthesia in Medical College Hospital. The patients are included in the study by applying the following inclusion and exclusion criteria.

Inclusion criteria

- a) Patients aged between 15 to 50 years of age posted for elective surgeries under general anesthesia
- b) ASA grade I and II patients
- c) Patients with Mallampatti airway grade I and II

Exclusion criteria

- a. Patients refusal
- b. Patients with medical comorbidities like Hypertension, ischemic heart diseases and arrhythmias
- c. Patients with Mallampatti III and IV
- d. Expected difficult intubation
- e. If patient is allergic to any of these drugs

Methods of collection of data – A specially designed proforma are used to collect the data which includes patient's particulars, indication for surgery, the anaesthetic details, intra-operative monitoring, observation for side effects etc.

60 patients are randomly allocated to three different groups of 20 each as using block randomization method of randomization as described below (group ML, CL, and NL)

Group ML –will receive magnesium sulphate 30mg/kg iv 3 minutes before induction

Group CL –will receive clonidine 3mcg/kg iv bolus 3 minutes before induction

Group NL –will receive normal saline 4ml iv 3 minutes before induction.

All three groups are coded as A, B, and C by co-ordinator. These are again randomized in all possible permutations and combinations e.g., BAC, CBA, ABC etc and a list of 20 such blocks are prepared by co-ordinator. Such blocks are selected randomly by chit method and given to the researcher ensuring adequate randomization. All the patients were visited the day

before surgery and preanesthetic counseling was done. All patients received Diazepam 10mg orally at night on the day before surgery. Patients are explained the procedure and informed/written consent obtained.

Anesthetic procedure:

- On arrival in the operating room, patient's basal parameters- B.P, heart rate and ECG are recorded using pulse oximetry, NIBP and ECG monitor.
- Intravenous access will be established and an IV infusion of Ringer lactate started
- All the patients are premedicated with Glycopyrrolate 0.2mg iv.
- Patients in each group receive respective drugs as per timing and dose mentioned earlier. The study drug will be prepared by anesthesia staff and the observer will be blind for study drug.
- After preoxygenation, Patients in each group is induced by Thiopentone sodium 5mg/kg iv. Then intravenous lignocaine 1.5mg/kg given. After this Succinyl choline 2mg/kg will be given followed by laryngoscopy and intubation with appropriate sized cuffed endotracheal tube.
- Anesthesia is maintained with Oxygen 33%. Nitrous Oxide 66% and Halothane 0.5 to 1% through Bain's circuit on controlled ventilation.
- Muscle relaxation is done with intermittent doses of Vecuronium Bromide and for analgesia iv tramadol 3mg/kg will be given.
- At the end of surgery reversal is done with Glycopyrrolate and Neostigmine 0.05mg/kg and patient will be extubated.
- The recovery time (the time between injection of reversal agent and extubation) will be noted.
- Patients recovery is monitored by Aldrete's score after extubation.
- All the parameters of the study will be recorded at following stages –preoperative
 - after giving the study drug
 - immediately after intubation
 - at 1 minute, 3 minutes, 5 minutes and 10 minutes after intubation.
- All groups are decoded at the end of study by taking information from co-ordinator. Group ML and Group CL will be studied for effects of combination of drugs and Group NL will be for study of effect of single drug and all three are compared in the end.

Results obtained are analyzed statistically

RESULTS

Table1: Age wise distribution of study subjects

Age group	Clonidine with lignocaine	Magnesium sulphate with lignocaine	Lignocaine only
< 25 yrs	05 (25%)	05 (25%)	02 (10%)
26 – 35 yrs	05 (25%)	08 (40%)	10 (50%)
36 – 45 yrs	05 (25%)	05 (25%)	05 (25%)
> 45 yrs	05 (25%)	02 (10%)	03 (15%)
Total	20 (100%)	20 (100%)	20 (100%)

The table shows the age distribution in control and the two study groups. The age range was 20 – 50 years for control and study groups.

Table2: Sex wise distribution of study subjects

Sex	Clonidine with lignocaine (CL)	Magnesium sulphate with lignocaine (ML)	Lignocaine only
Male	11 (55%)	09 (45%)	12 (60%)
Female	09 (45%)	11 (55%)	08 (40%)
Total	20 (100%)	20 (100%)	20 (100%)

In CL group, 55% were males and 45% were females

In ML group, 45% were males and 55% were females

In control, 60% were males and 40% were females

Table3: Comparison of heart rate (bpm) between three groups

Heart rate	Clonidine with lignocaine (A)	Magnesium sulphate with lignocaine (B)	Lignocaine only (C)	P value*	P value#		
					A-B	A-C	B-C
Baseline	89.85 +/- 13.9	97.80 +/- 21.73	91.95 +/- 10.83	0.28	0.27	0.91	0.49
Pre laryngeal	85.00 +/- 16.21	99.55 +/- 16.90	93.35 +/- 11.28	0.01	0.00	0.19	0.39
One min	98.25 +/- 12.34	109.50 +/- 14.54	115.15 +/- 11.33	0.00	0.02	0.00	0.35
Three min	98.00 +/- 11.37	104.10 +/- 15.17	109.75 +/- 12.34	0.02	0.30	0.01	0.36
Five min	96.25 +/- 11.18	100.95 +/- 15.71	103.20 +/- 14.56	0.28	0.53	0.26	0.86
Ten min	94.10 +/- 9.83	97.45 +/- 16.50	97.85 +/- 15.06	0.42	0.73	0.67	0.99

* ANOVA test, # Post-hoc tukey test, All values are in mean +/- sd

Statistical analysis of changes in heart rate prelaryngoscopy, post intubation at different (1,5,10) time intervals from onset of laryngoscopy and intubation in all the 3 study group is presented.

Group CL(A): The basal and prelaryngoscopy mean heart rate and standard deviations in this group were 89.85 +/- 13.9 and 85.00 +/- 16.21 respectively. After 1min of intubation 8.4bpm (9.34%) increase in the value of heart rate was observed with values of 98.25 +/- 12.34 and remained higher with a mean heart rate of 98.00 +/- 11.37 at 3 minutes. Subsequently a decreasing trend in the heart rate was noted starting from 5 minutes to 10 minutes after laryngoscopy. Mean heart rate at 5 minutes and 10 minutes were 96.25 +/- 11.18 and 94.10 +/- 9.83 respectively.

Group ML(B): The basal and pre laryngoscopy mean heart rate and standard deviations in this group were 97.80 +/- 21.73 and 99.55 +/- 16.90 respectively. After 1 min of intubation 11.7bpm (11.93%) increase in mean heart rate was observed with mean heart rate and standard deviations of 109.50 +/- 14.54. Subsequently decreasing trend in the heart rate was noted starting from 3 minutes to 10 minutes after laryngoscopy. Mean heart rate at 3, 5 minutes and 10 min were. 104.10 +/- 15.17, 100.95 +/- 15.71, and 97.45 +/- 16.50 respectively.

Group NL(C): The basal and pre laryngoscopy mean heart rate and standard deviations in this group were 91.95 +/- 10.83 and 93.35 +/- 11.28 respectively. After 1 min of intubation 23 bpm (25.01%) increase in heart rate was observed with mean heart rate 115.15.

No significant variations noted in all groups in heart rate basal recording. There was attenuation of heart rate response was observed after giving study drug in CL group.

Table4: Comparison of SBP (mmHg) between three groups

SBP	Clonidine with lignocaine (A)	Magnesium sulphate with lignocaine (B)	Lignocaine only (C)	P value*	P value [#]		
					A-B	A-C	B-C
Baseline	122.15 +/- 8.12	117.30 +/- 9.78	117.50 +/- 8.34	0.15	0.19	0.22	0.99
Pre laryngeal	114.50 +/- 7.30	114.15 +/- 15.26	113.75 +/- 15.07	0.98	0.99	0.98	0.99
One min	138.50 +/- 10.51	134.33 +/- 14.16	155.80 +/- 13.03	0.00	0.55	0.00	0.00
Three min	127.35 +/- 11.60	121.85 +/- 11.63	140.65 +/- 15.06	0.00	0.37	0.00	0.00
Five min	119.65 +/- 11.20	117.65 +/- 13.83	126.65 +/- 12.17	0.06	0.86	0.18	0.06
Ten min	116.20 +/- 9.71	119.95 +/- 12.28	119.80 +/- 9.57	0.06	0.40	0.52	0.05

* ANOVA test, # Post-hoc tukey test, All values are in mean +/- sd

Analysis of systolic blood pressure Statistical analysis of changes in systolic blood pressure at basal, prelaryngoscopy, post intubation at different (1,3,5,10) time intervals from the onset of laryngoscopy and intubation in all the 3 study group is presented.

Group CL (A) The basal and pre laryngoscopy mean SBP and standard deviations in this group were 122.15 +/- 8.12 and 114.50 +/- 7.30 respectively. After 1min of intubation 16.35 mm Hg (13.38%) increase in mean SBP was observed with mean SBP and standard deviations of 138.50 +/- 10.51. Subsequently a decreasing trend in the SBP was noted starting from 3 minutes to 10 minutes after laryngoscopy. Mean SBP at 3, 5 minutes and 10 minutes were 127.35 +/- 11.60, 119.65 +/- 11.20 and 116.20 +/- 9.71. At 10 minutes post laryngoscopy the SBP almost returned to base line with a mean value of 119.95 +/- 12.28.

Group ML(C) In this group basal systolic blood pressure was 117.30 +/- 9.78. After giving study drug prelaryngoscopy SBP decreased by 3mm of mm Hg to 114.15 +/- 15.26. Increase in systolic blood pressure of 17.03 mmHg (14.51%) with a mean of 134.33 +/- 14.16 was observed at 1 minute following laryngoscopy. After 3 min SBP fell by 12mmHg with a mean of 121.85 +/- 11.63, from there on a gradual fall in SBP was observed at 5 minutes mean SBP was 117.65 +/- 13.83. At 10 minutes post laryngoscopy the SBP almost returned to base line with a mean value of 119.95 +/- 12.28.

Group NL (C) In this group basal systolic blood pressure was 117.50 +/- 8.34. After giving study drug prelaryngoscopy SBP decreased by 4 mm Hg to 113.75 +/- 15.07. Increase in systolic blood pressure of 38.3mm Hg (32.59%) with a mean of 155.80 +/- 13.03 was noted at 1 minute following laryngoscopy. After 3 min SBP fell by 23.15 mmHg (19.70%) with a mean of 140.65 +/- 15.06, from there on a gradual fall in SBP was noted. At 5 minutes it was 126.65 +/- 12.17. At 10 minutes post laryngoscopy the systolic blood pressure almost returned to base line with a mean value of 119.80 +/- 9.57.

No significant variations were noted in all groups in SBP at basal and after giving study drug. The increase of systolic blood pressure at one and three minutes after intubation was significantly less in ML group and CL group compared to NL group, But there was no significant reduction in increase of SBP at five and ten minutes of recording. There was no significant changes in attenuation of SBP response between ML group and CL group at any time of recording.

Table 5: Comparison of DBP (mmHg) between three groups

DBP	Clonidine with lignocaine (A)	Magnesium sulphate with lignocaine (B)	Lignocaine only (C)	P value*	P value [#]		
					A-B	A-C	B-C
Baseline	87.90 +/- 5.55	78.95 +/- 7.60	77.35 +/- 7.48	0.11	0.37	0.10	0.74
Pre laryngeal	77.15 +/- 9.04	77.50 +/- 13.87	117.30 +/- 18.72	0.39	1.00	0.45	0.46
One min	90.60 +/- 7.68	90.25 +/- 13.75	101.75 +/- 8.14	0.00	0.99	0.00	0.00
Three min	84.65 +/- 7.80	79.90 +/- 11.93	92.85 +/- 11.73	0.00	0.34	0.04	0.00
Five min	80.35 +/- 10.27	79.60 +/- 15.73	82.55 +/- 13.49	0.76	0.98	0.86	0.76
Ten min	76.10 +/- 7.65	72.40 +/- 13.78	77.15 +/- 9.80	0.34	0.52	0.94	0.34

*ANOVA test, # Post-hoc tukey test, All values are in mean +/- sd

Analysis of diastolic blood pressure Statistical analysis of changes in systolic blood pressure at basal, prelaryngoscopy, post intubation at different (1,3,5,10) time intervals from the onset of laryngoscopy and intubation in all the 3 study group is presented.

Group CL (A) In this group pre-induction diastolic blood pressure was 83.90 \pm 5.55. After giving study drug pre-laryngoscopy DBP decreased by 11 mm Hg to mean of 77.15 \pm 9.04. Increase in diastolic blood pressure of 6.70 mmHg (7.9%) with a mean of 90.60 \pm 7.68 was noted at 1 minute following laryngoscopy. After 3 min DBP fell by 6 mmHg (6.8%) with a mean of 84.65 \pm 7.80, from there on a gradual fall in DBP was noted. At 5 minutes it was 80.35 \pm 10.27. At 10 minutes post laryngoscopy the DBP decreased to less than base line with a mean value of 76.10 \pm 7.65.

Group ML (B) In this group pre-induction diastolic blood pressure was 79.95 \pm 7.60. After giving study drug pre-laryngoscopy DBP decreased by 1 mm Hg to mean of 77.50 \pm 13.87. Increase in diastolic blood pressure Of 10.30 mm Hg (12.8%) with a mean of 90.25 \pm 13.75 was noted at 1 minute following laryngoscopy. After 3 min DBP was 79.90 \pm 11.93, from there on a gradual fall in DBP was noted. At 5 minutes it was 79.60 \pm 15.7, At 10 minutes post laryngoscopy the DBP decreased to less than base line with a mean value of 72.40 \pm 13.78.

Group NL (C) In this group pre-induction diastolic blood pressure was 77.35 \pm 7.48. After giving study drug pre-laryngoscopy DBP decreased to mean of 75.30 \pm 11.87. Increase in diastolic blood pressure Of 24.40 mm Hg (31.54%) with a mean of 101.75 \pm 8.14 was noted at 1 minute following laryngoscopy. After 3 min DBP fell by 15.5 mmHg (20.0%) with a mean of 92.85 \pm 11.7, from there on a gradual fall in DBP was noted. At 5 minutes it was 82.55 \pm 13.49. At 10 minutes post laryngoscopy the DBP decreased to less than base line with a mean value of 77.15 \pm 9.80. No significant variations were noted in all groups in diastolic blood pressure at basal and after giving study drug. There was significant attenuation of DBP response at one minute and three minutes after intubation in CL group and ML group compared to NL group however there was no significant difference in attenuation of DBP at five and ten minutes of recording. There was no significant difference in attenuation of DBP response between ML group and CL group at any time of recording.

Table6: Comparison of MAP (mmHg) between three groups

Heart rate	Clonidine with lignocaine (A)	Magnesium sulphate with lignocaine (B)	Lignocaine only (C)	P value*	P value#		
					A-B	A-C	B-C
Baseline	94.55 \pm 7.01	91.45 \pm 8.58	134.55 \pm 20.07	0.43	0.99	0.52	0.47
Pre laryngeal	87.50 \pm 6.49	87.50 \pm 11.90	88.35 \pm 13.08	0.96	1.00	0.96	0.96
One min	107.30 \pm 13.01	103.35 \pm 13.22	116.80 \pm 10.66	0.00	0.57	0.04	0.00
Three min	97.25 \pm 8.61	95.35 \pm 11.16	107.75 \pm 14.36	0.00	0.86	0.01	0.04
Five min	93.25 \pm 10.31	91.70 \pm 15.00	97.25 \pm 12.25	0.36	0.92	0.58	0.35
Ten min	90.25 \pm 7.55	84.70 \pm 11.64	95.65 \pm 13.61	0.37	1.00	0.44	0.44

* ANOVA test, # Post-hoc tukey test, All values are in mean \pm sd

Analysis of MAP Statistical analysis of changes in MAP at basal, pre-laryngoscopy, post intubation at different (1, 3, 5, 10,) time intervals from the onset of laryngoscopy and intubation in all the 3 study group is presented.

Group CL (A) In this group basal MAP was 94.55 \pm 7.01. After giving study drug pre-laryngoscopy MAP decreased by 7.06 mm Hg to mean of 87.50 \pm 6.49. Increase in MAP Of 10.30 mm Hg (11.13%) with a mean Of 107.30 \pm 13.01 was noted at 1 minute following laryngoscopy. After 3 minutes mean MAP was 97.25 \pm 8.61, from there on a gradual fall in MAP was noted. At 5 minutes it was 93.25 \pm 10.31. At 10 minutes post laryngoscopy the MAP almost returned to base line with a mean value of 90.25 \pm 7.55.

Group ML (B) In this group pre-induction MAP was 91.45 \pm 8.58. After giving study drug pre-laryngoscopy MAP decreased by 4 mm Hg to mean of 87.50 \pm 11.90. Increase in MAP of 11.9 (13.01%) mm Hg with a mean Of 103.35 \pm 13.22 was noted at 1 minute following laryngoscopy. After 3 min mean MAP was 95.35 \pm 11.16, from there on a gradual fall in MAP was noted as at 5 minutes it was 91.70 \pm 15.00. At 10 minutes post laryngoscopy the DBP almost returned to base line with a mean value of 84.70 \pm 11.64.

Group NL (C) In this group pre-induction MAP was 94.55 \pm 20.07. After giving study drug pre-laryngoscopy MAP decreased by 6 mm Hg to mean of 88.35 \pm 13.08. Increase in MAP Of 22.25 mm Hg (24.35%) with a mean of 116.80 \pm 10.66 was noted at 1 minute following laryngoscopy. After 3 min mean MAP was 107.75 \pm 14.36, from there on a gradual fall in MAP was noted. At 5 minutes it was 97.70 \pm 12.25. At 10 minutes post laryngoscopy the systolic blood pressure almost returned to base line with a mean value of 95.65 \pm 13.61. No significant variations were noted in all groups in mean arterial pressure at basal and after giving study drug. There was significant reduction of increase in MAP at one minute and three minutes after intubation in CL group and ML group compared to NL group, however there was no significant difference in attenuation of MAP between CL group and ML group at any time of recording.

DISCUSSION

Many factors influence the cardiovascular changes associated with laryngoscopy and intubation. Age, drugs, type and duration of procedures, depth of anesthesia, hypoxia, hypercarbia etc., influence the pressor response. Variations of heart rate changes decrease with increasing age. Young patients show more extreme changes.¹⁸ Marked fluctuations in hemodynamic responses are often seen in geriatric patients^{14,15}.

In our study we selected the optimal age range of 18 to 50 years. Patients on antihypertensive drugs may exhibit a decrease in pressor response. We excluded the patients on antihypertensive medications from our study. Thiopentone was selected for induction since it still continues to be the most popular agent for induction. In normovolemic patients thiopentone 5mg/kg i.v can transiently decrease 10-20mm Hg of blood pressure and increase the heart rate by 15-20 beats/min.⁴³ There is increase in catecholamine levels, both noradrenaline and adrenaline¹⁶.

Succinyl choline has negative inotropic and chronotropic effect. It acts on the muscarinic receptors of SA node. A marked noradrenergic response was noted when intubation was performed under succinylcholine¹⁷. Nitrous oxide may increase the tone of sympathetic nervous system. The direct action of Nitrous oxide is negative inotropism which is offset by increased sympathetic tone. Halothane has potency to decrease the heart rate but at concentration used for maintenance it does not appreciably change the heart rate¹⁸.

Nasotracheal intubation comprises of three distinct phases a) nasopharyngeal intubation b) direct laryngoscopy to identify the vocal cords and c) Passage of tracheal tube into the trachea. Nasopharyngeal intubation causes significant pressor response. This response is heightened by the passage of tracheal tube in the larynx and trachea in our study we included only direct laryngoscopy and orotracheal intubation. Laryngoscopy alone may produce most of the cardiovascular responses reported after laryngoscopy and tracheal intubation during anaesthesia. The most significant laryngoscopic factor influencing cardiovascular responses is found to be the duration of laryngoscopy. A linear increase in heart rate and mean arterial pressure during the first 45 seconds has been observed. Further prolongation has little effect. As the duration of laryngoscopy is normally less than 30 seconds, the results of studies in which it takes longer than this have less clinical relevance. The force applied during laryngoscopy has only minor effect.⁴⁸ In our study the duration of laryngoscopy and intubation was limited to 20 seconds.

Adequate care was taken to achieve the required depth of anesthesia avoiding hypoxia and hypercarbia which can influence the hemodynamic variations. Excluding hypoxia and hypercarbia other contributory causes of hypertension and tachycardia

could be continued manifestation of anxiety concerning anesthesia and surgery, glycopyrrolate premedication, reflex baroreceptor effect after thiopentone and possible effect of suxamethonium. But they seem to be less important than laryngotracheal stimulation during laryngoscopy and intubation. Attenuation of sympathetic responses during laryngoscopy and intubation is of prime concern to the anaesthetist more so in high risk subjects as mentioned earlier. Many strategies have been recommended which include minimising the duration of laryngoscopy to less than 20 seconds, topical application of local anaesthetics, iv blockers, calcium channel blockers, Clonidine, Sodium Nitroprusside, lignocaine. No single drug or technique is satisfactory. Each technique has advantages and disadvantages, the most obvious being that the prevention often outlasts the stimulus.

The sequence of induction anaesthesia, laryngoscopy and tracheal intubation are associated with marked haemodynamic changes and autonomic reflex activity which may be a cause of concern in many high risk patients¹⁹. Laryngoscopy and intubation is associated with rise in heart rate, blood pressure and incidence of cardiac arrhythmias. These potentially dangerous changes disappear within 5 minutes of onset of laryngoscopy²⁰. Although these responses of blood pressure and heart rate are transient and short lived they may prove to be detrimental in high risk patients especially in those with cardiovascular disease, increased intracranial pressure or anomalies of the cerebral blood vessels²¹. In group NL inj lignocaine 1.5mg/kg i.v. 3 minutes before laryngoscopy and intubation was used to blunt the pressor response, the base line value of heart rate was 91.95 bpm. One minute following laryngoscopy and intubation, the heart rate increased to 115.50 bpm, representing a rise of 23.25 bpm above the base line value.

By 3 minutes, it was 109.75 bpm, representing a rise of 18.25 bpm above the base line value. By 5 minutes it was 103.20 bpm, representing a rise of 11.5 bpm above the base line it was seen that the elevated heart rate started settling down towards base line value by 10 minutes at 97.85. CD Miller²² et al employed a dose of 1.5 mg lignocaine and noticed a rise in the heart rate (HR) of 25 bpm and Splinter et al noticed it to be 19 bpm. Hence the results of the present study with regards to increase in the heart rate observed following laryngoscopy and intubation concurs with the observation made by Splinter et al. and CD Miller.

Group ML: where Inj. MgSO₄ 30mg/kg i.v. + lignocaine 1.5mg/kg i.v 3 minutes before laryngoscopy and intubation was used to blunt the pressor response, the base line value of Heart rate was 97.80 bpm. One minute following laryngoscopy and intubation, the heart rate increased to 109.50 bpm, representing a rise of 11.70 bpm above the base line value. By 3 minutes, it was 104.10 bpm, representing a rise of 6.30 bpm

above the base line value. By 5 minutes it was 100.95 bpm, representing a rise of 3.15 bpm above the base line. It was seen that the elevated heart rate started settling down towards base line value by 5 minutes reached baseline value at 10 min 97.45. Dr santhosh kumar²³ employed study using $MgSO_4$ 60mg /kg and noticed that maximum heart rate increased after intubation is 15. Hence the results of the present study with regards to increase in the heart rate observed following laryngoscopy and intubation concurs with the observation made by Dr santhoshkumar et al and Michael FM et al. In group CL Inj. Clonidine 3 μ g/kg i.v.+lignocaine 1.5mg/kg i.v 3 minutes before laryngoscopy and intubation was used to blunt the pressor response, the base line value of mean heart rate was 89.85 bpm One minute following laryngoscopy and intubation, the heart rate increased to 98.25 bpm, representing a rise of 8.40 bpm above the base line value.

By 3 minutes, it was 98.10 bpm, representing a rise of 8 bpm above the base line value. By 5 minutes it was 96.25. bpm, representing a rise of 6.15 bpm above the base line. It was seen that the elevated heart rate started settling down towards base line value by 5 minutes and at 10 min HR was 94.10 a difference 4bpm compared to baseline was observed. In Marco P. Zalunardo²⁴ et al employed Clonidine 311g/kg i.v. 3 minutes before laryngoscopy and intubation to blunt the, pressor response and found that difference between base line and 10min post intubation heart rate was 2.4 bpm. In Peter J. Kulka et al¹⁰ study mean heart rate after intubation was (67+/- 12) bpm. In group NL the basal value of Systolic blood pressure, Diastolic blood pressure, and Mean arterial pressure was 117.50 mm Hg, mm 77.35 Hg, and 94.55 mm Hg respectively. Following laryngoscopy and intubation, the maximal rise in Systolic blood pressure (SBP) was found to be 38.30 mm Hg, that of Diastolic blood pressure (DBP) was 20.45 mm Hg and that of Mean arterial pressure (MAP) was 22.33 mm Hg. These elevated pressure readings started coming down by 3 minutes. However they remained above the baseline value even at the end of 5 minutes and reached baseline at 10 mins.

Stanley Tam employing inj. Lignocaine 1.5 mg/kg i.v 3 minutes before laryngoscopy and intubation to blunt the pressor responses, found out the maximal increase in SBP was (15)12 mm Hg, DBP was 9 mm Hg and MAP to be 11 mm Hg. Mounir Abou- Madi et al.²³ noticed the change in SBP by 30 mm Hg, change in the DBP was 22 mm Hg. CD Miller³⁷ noticed a increase in SBP to be 33 mm Hg, DBP to be 37 mm Hg. Splinter et al. noticed a change in SBP to be 26 mm Hg, DBP to be 41 mm Hg and change in MAP to be 44 mmHg. In group ML Inj. $MgSO_4$ 30mg/kg i.v. 3 minutes before laryngoscopy and intubation was used to blunt the pressor response, the basal value of Systolic blood pressure (SBP), Diastolic blood pressure (DBP), and Mean arterial pressure

(MAP) was 117.30 mm Hg, mm 78.95 Hg, and 91.45 mm Hg respectively. Following laryngoscopy and intubation, the maximal rise in Systolic blood pressure (SBP) was found to be 17.03mm Hg, that of Diastolic blood pressure (DBP) was 11.30 mm Hg and that of Mean arterial pressure (MAP) was 11.9 mm Hg. These elevated pressure readings started coming down by 3 minutes. However they remained above the baseline value even at the end of 5 minutes and reached baseline at 10 mins

In the study of Dr. Santosh Kumar using $MgSO_4$ i.v 30mg/kg 3 minutes before laryngoscopy and intubation to blunt the pressor responses, found out the maximal increase in SBP was 5 mm Hg, DBP was 4 mm Hg and MAP to be 4mm Hg. In K. Montazeri et al study employing $MgSO_4$ i.v 30mg/kg 3 minutes before laryngoscopy and intubation to blunt the pressor responses, found out the maximal increase in MAP to be 20 mm Hg

In group CL Inj clonidine 3 μ g/kg i.v. 3 minutes before laryngoscopy and intubation was used to blunt the pressor response, the basal value of Systolic blood pressure (SBP), Diastolic blood pressure (DBP), and Mean arterial pressure (MAP) was 122.15 mm Hg, mm 83.90 Hg, and 96.5d5 mm Hg respectively. Following laryngoscopy and intubation, the maximal rise in Systolic blood pressure (SBP) was found to be 16.35mm Hg, that of Diastolic blood pressure (DBP) was 6.70 mm Hg and that of Mean arterial pressure (MAP) was 12.75 mm Hg. These elevated pressure readings started coming down by 3 minutes. However they remained above the baseline value even at the end of 5 minutes and at 10 minutes difference Of MAP between basal and 10 min after intubation was 4 mm hg

In study done by In Marco P Zalunardo²⁴ with clonidine 3 u/kg the difference of MAP between basal and 10 min after intubation was 21.1.

CONCLUSION

With respect to attenuation of blood pressure responses, there were no significant differences between clonidine & lignocaine group and $MgSO_4$ & lignocaine group during at different times after laryngoscopy and intubation. In group clonidine and lignocaine, there was statistically significant attenuation of heart rate responses at one minute as compared to $MgSO_4$ and lignocaine.

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