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To Compare And Study The The Efficacy Of Intravenous Dexmedetomidine And Magnesium Sulphate In Attenuating The Hemodynamic Changes Following Direct Laryngoscopy And Intubation

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Abstract

Introduction: Laryngoscopy and Intubation have a noxious stimulus on various systems of the body which includes hypertension Tachycardia and arrhythmias. To attenuate these hemodynamic changes agents like Lignocaine dexmedetomidine magnesium sulphate are used. In our study we have compared the efficacy of Dexmedetomidine and magnesium sulphate in attenuating the intubation response.

Material And Methods:60 patients were included in our study. They were divided into groups of 30 each. Group D received IV dexmedetomidine 0.5 mcg /kg and Group M received IV magnesium sulphate 30mg/kg. The patients were induced in General anaesthesia. Patients were assessed for their hemodynamic stability ,coughing reflex, PONV, shivering post extubation

Results And Conclusion: Our study concluded that 0.5mcg/kg of dexmedetomidine is more effective than 30 mg/kg of IV magnesium sulphate to attenuate extubation response and maintaining of hemodynamic stability

Keywords: Dexmedetomidine , magnesium sulphate, extubation, attenuate

Introduction

Endotracheal intubation and direct laryngoscopy is an essential component of General anaesthesia.Intubation was first introduced in last half of 19th century and since then is the most frequently performed procedure.(1)Laryngoscopy and intubation have a noxious stimuli on various systems of the body which includes tachycardia hypertension and arrhythmias too due to increase in plasma norepinephrine concentration.Many research articles are published before on the effects of intubation and laryngoscopy and methods to attenuate these effects [2-5].These changes are mostly seen due to reflex sympathetic discharge caused by stimulation of upper respiratory tract which is due to increase in plasma catecholamine concentration and attenuated by b adrenergic blockade. Various agents like lignocaine , dexmedetomidine magnesium sulphate have been used to reduce to attenuate the intubation response In our study we are comparing dexmedetomidine and magnesium sulphate

Dexmedetomidine is a a2 receptor agonist which has more selective action on a2A and a2C receptors.Locus ceruleus in the brainstem and the spinal cord being principal site of action for sedation and analgesia respectively act via a2A receptors .FDA has also approved its use in sedation in ICU.It has been used as a premedication prior to surgeries due to its sedative anxiolytic analgesic sympatholytic and stable hemodynamic conditions .It also used in blunting the response to intubation and laryngoscopy.Dexmedetomidine at IV doses of 0.33-0.67 mcg/kg given 15 minutes prior to the surgery helps in attenuation of laryngoscopy

response.It is also used for sedation in MRI and CTscan and monitored anaesthesia .(11,12)

Magnesium sulphate is a drug with many clinical applications.It acts by intervening in the activation of membrane Ca ATPase and Na-K ATPase involved in the transmembrane ion exchanges during depolarization and repolarization phases.It acts as a stabiliser of cell membrane and intracytoplasmic organelles.Magnesium also aids in reducing the stress post intubation due to release of catecholamines and decrease in the arterial blood pressure(14) Magnesium sulphate has also shown to reduce the muscle relaxant requirement intraoperatively

Materials And Methods:

This is a prospective randomised, double blind study which included 60 patients of American Society of Anaesthesiologists physical status l and ll, either sex , bodyweight between 45-70kg ,age 18-50 years undergoing elective surgery under general anaesthesia.Informed written consent was taken from the patients for the study.Institutional ethics commmittee approval was taken prior to the start of study.

Patients with history of any cardiac or renal diseases,those who did not give consent for the study,with any comorbidities like diabetes and hypertension ,obesity and anticipated difficult intubation patients were excluded from the study. Pre Anaesthetic checkup was done the previous day.

Non -invasive blood pressure[NIBP],Heart rate [HR] peripheral oxygen saturation [SPO2]and end tidal carbon dioxide [ETCO2] were monitored.All patients received inj Glycopyrrolate 0.1 mg and inj Midazolam 1 mg as premedication.Anesthesia was induced with 1.5-2 mg /kg of inj Propofol and inj Fentanyl 2mcg/kg . Inj vecuronium 0.1 mg/kg was used as neuromuscular relaxation.

Patient were intubated with appropriate size of high volume low pressure portex endotracheal tubes.Patient was maintained on isoflurane and 66%of nitrous oxide in oxygen via mechanical ventilation.Anaethetist was was blinded to the study prepared solution of drugs for the two groups . Patients in group D[n=30] received 0.5mg/kg of

IV Dexmedetomidine and patients in group M [n=30] received IV magnesium sulphate 30 mg/kg over 10 mins prior to induction.Isoflurane and nitrous oxide were discontinued at the end of the procedure and patient was reversed with 0.05mg /kg of neostigmine and 0.008 mg/kg of glycopyrrolate.Prior to the extubation oropharyngeal secretions were suctioned.The patient was administered 100% oxygen on face mask.The patients were assessed for the coughing reflex ,PONV,shivering and sedation post extubation.

PONV was graded as:

Grade 1-No nausea no vomiting

Grade 2-nausea,no vomiting

Grade 3-nausea and vomiting

Coughing after extubation was assessed with

1. No coughing
2. Minimal or no coughing
3. Moderate coughing [3-4 times]
4. Severe coughing [5-10 times]
5. Poor extubation ,very uncomfortable and forced breathing {laryngospasm and coughing >10times]

Ramsay sedation score was used to assess the degree of sedation

1. Anxious and agitated or restless or both
2. Co-operative oriented and tranquil
3. Responding to commands only
4. Brisk response to light glabellar tap or loud auditory stimulus
5. Sluggish response to light glabellar tap or loud auditory stimulus
6. No response to stimulus.

Shivering was graded as : 0-no shivering

1. Mild i.e. localised to neck and or thorax only
2. moderate i.e.shivering involves gross movement of upper extremities with neck and thorax.
3. Severe i.e shivering involves gross movements of the trunk and both extremities.

Any laryngospasm bronchospasm and desaturation was noted

Hemodynamic variables like HR, NIBP and SPO2 were noted before the administration of the drug then at interval of 1,3, 5,10 and 15 min after giving the drug and 1,3 ,5, 10 mins after extubation were noted respectively.After extubation the patients were shifted to the post anaesthesia care unit.

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Result:

There was no significant difference betwween age, weight and sex in both groups namely Group D and Group M.

There was no significant difference in baseline heart rate in both the groups.Heart rate was significantly less in Group D as compared to Group M at 1,3,5 and 10 mins as observed in **Table 1.**

The baseline SBP in group D was 80.26 and Group M was 79.53 which was not statistically significant.But there was significant difference in mean SBP at 1,3,5 and 10 mins in group M and Group D as seen in **Table 2**. There was a significant difference in SBPat 1 min after intubation since the mean SBP in Group M was 128 and that in Group D was 155 . Also there is significant statistical difference in SBP at intervals 3, 5 and 10 mins respectively.

There was no significant difference in baseline mean DBP in Group D and Group M.But there was statistical significance in mean DBP in both groups at intervals of 1 and 3 mins respectively post intubation as seen in **Table 3.**

The mean baseline MAP was 92.80 in Group M and which was comparable to the mean MAP of 92.53 in GROUP D which was not statistically significant.The mean MAP in Group M was 111.49 and Group D was 97.27 in group D at 1 min post intubation which was significantly less.There was significant statistical significance in the mean MAP at intervals of 1, 3, 5 ,10 mins respectively as seen in **Table 4.**

Table 1:Comparison of heart rate [beats/min] between dexmedetomidine and magnesium sulphate

PARAMETERS	GROUP D	GROUP M	P value
HR at baseline	80.26+_2.44	79.53+_3.39	0.38
5 mins after infusion	79.13+_2.66	79.66+_2.97	0.53
HR at induction	76.80+_2.75	77.60+_2.64	0.22
HR at 1 min post induction	81.33+_3.33	86.93+_4,44	<0.0001
HR at 3 min post induction	79.33+_3.37	85.86+_3.99	<0.0001
HR at 5 min post induction	76.13+_3.14	83.66+_4.003	<0.0001
HR at 10 min post induction	74.73+_2.94	80.53+_3.52	<0.0001

Group D : Dexmedetomidine Group M magnesium sulphate

Table2:Comparison of SBP[mm/Hg] between Dexmedetomidine and magnesium sulphate

PARAMETER	GROUP D	GROUP M	P value

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SBP at baseline	119.40+_4.52	120.13+_4.03	0.51
SBP 5 mins after infusion	119.80+_4.58	120.27+_3.92	0.67
SBP at induction	116.07+_3.25	116.20+_3.29	0.73
SBP at 1 min post intubation	128+_7.33	155.80+_9.53	<0.0001
SBP at 3 min post intubation	124.20+_6.33	146.80+_9.09	<0.0001
SBP at 5 min post intubation	119+_4.48	133.80+_7.88	<0.0001
SBP at 10 min post intubation	114.73+_3.61	120.27+_5.29	<0.0001

Table 3;Comparison of DBP[mm/Hg] between Dexmedetomidine and magnesium sulphate

PARAMETER	GROUP D	GROUP M	P value
DBP at baseline	79.53+_4.59	79.13+_5.88	0.56
DBP 5 mins after infusion	79.33+_5.66	78.66+_5.39	0.66
DBP at induction	76.53+_7.51	73.60+_5.13	0.18
DBP at 1min post intubation	82.06+_8.007	89.33+_6.65	<0.0006
DBP at 3 min post intubation	74.86+_8.26	80.26+_7,67	<0.0082
DBP at 5 min post intubation	71.86+_7.12	74.66+_5.68	0.59
DBP at 10 min post intubation	69.26+_6.023	71.60+_5.71	0.12

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Table 4:Comparison of MAP [mmHg] between Dexmedetomidine and magnesium sulphate

PARAMETER	GROUP D	GROUP M	P Value
MAP at baseline	92.53+_4.62	92.80+_5.108	0.76
MAP 5 mins after infusion	92.82+_4.60	92.53+_4.62	0.80
MAP at induction	89.71+_5.25	87.80+_4.19	0.13
MAP at 1min post intubation	97.27+_5.41	111.49+_7.26	<0.0001
MAP at 3 min post intubation	91.31+_5.38	102.44+_7.76	<0.0001
MAP at 5 min post intubation	87.57+_4.88	94.37+_5.99	<0.0001
MAP at 10 min post intubation	84.42+_4.38	87.82+_5,39	<0.0122

Table 5: Comparison of mean grading of cough emergence and extubation time

variables	Group D	Group M	P value
Grade of cough	1.82+_0.62	2.60+_0.57	0.001
Emergence time[mins]	19.52+_5.29	20.72+_4.62	0.397
Extubation time[mins]	14.80+_5.42	14.62+_4.97	0.871
Sedation score	3.08+_0.86	4.72+_0.79	0.001
Pain score	0.84+_1.10	2.48+_0.82	0.001
PONV	1+_ 0	1.5+_0.48	0.002

Discussion:

Extubation is often associated with tachycardia, hypertension, coughing ,straining which not only causes discomfort to the patient but also affects the post surgical outcome.Hence various studies have

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been conducted in the past which included various drugs to attenuate the extubation response

In our study we have compared dexmedetomidine and magnesium sulphate which have desirable outcomes for attenuating the extubation response and with a good hemodynamic stability .A similar study conducted by modh et al [6] in which the subjects were randomly allocated in group where dexmedetomidine was given and the other group received normal saline which showed significant reduction in heart rate in the group of patients receiving dexmedetomidine which was consistent with our study

In our study dexmedetomidine was compared to magnesium sulphate to attenuate the heart rate.During induction dexmedetomidine and magnesium sulphated both showed reduction in heart rate but dexmedetomidine showed reduction of heart rate to 81.3 while magnesium sulphate showed the reduction in heart rate to 86.9.This was in agreement to the study by Mahajan et al in which120 patients were randomised to receive magnesium sulphate [group MS] dexmedetomidine[group DS] and normal saline[group NS].It was concluded that SBP,DBP and HR fell in group MS and DS and post extubation SBP,DBP and HR were also significantly lower.[9]

In a study by Alam et al the subjects were divided in two groups A and B who received dexmedetomidine and magnesium sulphate respectively.It was concluded that SBP was more in patients receiving magnesium sulphate with significant values at 5, 10, 15 minutes respectively.Similarly DBP values were also more in magnesium sulphate receiving group.The study concluded that both dexmedetomidine and magnesium sulphate were both effective in reducing the SBP and DBPand attenuating the laryngoscopy response,but dexmedetomidine is more effective in controlling HR.[10] This study was in agreement with our study.

In a study conducted by chaitanya et al patients were divided into two groups Group D received dexmedetomidine and Group M received Magnesium sulphate ten minutes before intubation.This study concluded that both magnesium sulphate and dexmedetomidine attenuated the rise in SBP and DBP but magnesium sulphate failed to attenuate to increase in the HR as compared to dexmedetomidine which was effective in controlling the rise in HR following intubation.[7]This result was in agreement with our study

Tandon et al conducted a study in which the patients were divided in three groups.Group D received dexmedetomidine Group M received Magnesium sulphate and Group C received normal saline . SBP DBP and HR increased during emergence in all three groups but these parameters were significantly lower in Group D as compared to group M and lower in Group M as compared to group C.They concluded that dexmedetomidine is more effective than magnesium sulphate in controlling hemodynamics and airway reflexes.[8]This was in agreement to our study.

Rani et al compared dexmedetomidine and fentanyl in their study and had concluded that single dose of 0.75mcg/kg of dexmedetomidine given 15 mins prior to extubation helps in smooth extubation.[11]Our study showed similar results with a suppressed cough reflex and response to suctioning during extubation was noted with dexmedetomidine than magnesium sulphate

Limitations of our study were ASA 3 and 4 patients were not included and different doses of drugs were not used

Conclusion:

Our study concluded that 0.5mcg/kg of dexmedetomidine is more effective than 30mg/kg of magnesium sulphate to attenuate the extubation response and maintaining hemodynamic stability

Abbreviations: ASA:American society of anaesthesiologists SBP:systolic blood pressure DBP: Diastolic blood pressure HR:Heart rate PONV :postoperative nausea and vomiting

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