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Anesthesiology

KEY WORDS: Clonidine; MgSO4; esmolol; hemodynamic responses; laryngoscopy; endoscopic surgeries

To compare the role of i.v clonidine, MgSO4 and esmolol in attenuating hemodynamic responses following laryngoscopy and intubation and on blood loss in patients undergoing endoscopic sinus surgeriessurgeries

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ABSTRACT

Aim: The aim of our study was to compare the role of i.v clonidine, MgSO4 and esmolol in attenuating hemodynamic responses following laryngoscopy and intubation, in maintaining peri-operative HR and MAP, and on blood loss in patients undergoing endoscopic sinus surgeries(ESS).

Material & method : 80 normotensive patients, undergoing ESS, ASA I and II physical status were divided into 4 groups of 20 patients each. In group I patients received 10 ml normal saline followed by same volume normal saline infusion, in group II patients received 2µg/kg clonidine in 10 ml NS bolus 5 min before induction followed by 1µg/kg/hr infusion, group III patients received 30 mg/kg magnesium sulphate in 10 ml NS bolus just before induction followed by 10mg/kg/hr infusion and in group IV patients received 1mg/kg esmolol in 10 ml NS bolus just before induction followed by 0.6mg/kg/hr infusion.

Result and conclusion: Clonidine and esmolol are better in controlling the rise in HR and MAP following laryngoscopy and intubation.The amount of bleeding and surgeon satisfaction score were also better in clonidine and esmolol group compared to MgSO4 and control group.

Introduction:

The study to compare the role of i.v clonidine, MgSO4 and esmolol in attenuating hemodynamic responses following laryngoscopy and intubation, in maintaining peri-operative HR and MAP and on blood loss in patients undergoing endoscopic surgeries was carried out at National Institute Of Medial Science, Jaipur.

Material and method:

This study was carried out on 80 normotensive patients of either sex belonging to age group of 18-60 years and American Society of Anaesthesia grade 1 and 2 undergoing functional endoscopic sinus surgeries under general anaesthesia. After obtaining due clearance from the Ethical Committee and informed consent from the patients they were randomlydivded into 4 groups, by chit method, consisting of 20 patients each. A day before surgery, a detailed pre anaesthetic check-up was done. Patients were asked to keep nil by mouth by restricting fluids and solids for at least 6 hrs before the operation. On the day of surgery, injection glycopyrrolate 0.2 mg was given by i.v route 45 min before the operation and injection midazolam 0.04 mg/kg body weight by the intravenous route just before the procedure started. Pre-operatively vitals like pulse rate, non-invasive systolic and diastolic blood pressure (DBP) and respiratory rate was recorded. In the operation room, a good intravenous access was secured and patients were preloaded with 10 ml/kg body weight of Ringer Lactate solution over 15-20 min. Multipara monitor was attached to the patient and baseline pulse rate, non-invasive systolic blood pressure (SBP) and DBP, oxygen saturation, and electrocardiogram (ECG) were recorded. In group I patients received 10 ml normal saline followed by same volume normal saline infusion , in group II patients received 2µg/kg clonidine in 10 ml NS bolus 5 min before induction followed by 1µg/kg/hr infusion, group III patients received 30 mg/kg magnesium sulphate in 10 ml NS bolus just before induction followed by 10mg/kg/hr infusion and in group IV patients received 1mg/kg esmolol in 10 ml NS bolus just before induction followed by 0.6mg/kg/hr infusion.Then vital parameters were noted.

Statistical analysis:

All the data obtained were analyzed using the Analysis of Variance Technique (ANOVA) and Student-t test.There was no statistical difference between the groups regarding to sex of the patients.

Results:

In our study, we observed the Heart rate, Systolic blood pressure(table 1), Diastolic blood pressure(table 2), Mean arterial pressure, blood lossand surgeon satisfaction score in all the 4 groups throughout the peri-operative period.There was no significant difference in the type of surgery as it all involved sinuses(Table3). The rise in HR and MAP following laryngoscopy and intubation was maximum in group I, HR by 14.40 beats/min, MAP by 10.72 mm Hg above baseline and gradually returned to baseline in 10-15 minutes.

In group II, III and IV the HR and MAP remained below baseline following laryngoscopy and intubation. Significant ($p<0.001$) decrease in HR (6.45beats/min and 8.1beats/min) and MAP (12.8 mmHg and 8.33 mmHg) was seen in group II and group IV respectively, while insignificant ($p>0.05$) decrease was seen in group III (1.2 beats/ min and 3.75 mm Hg) compared to their baseline values.

HR and MAP differences were statistically significant ($p<0.001$) in group II and group IV compared to group I and III but it was statistically insignificant ($p>0.05$) between group II and group IV. There was also significant difference in HR and MAP of group III when compared to group I.(Table 4, Table 5).The baseline MAP in group I, II, III and IV was around 96.28±5.40, 94.02±7.40, 100.53±8.80 and 99.13±10.06 mmHg respectively in our study. It decreased to 94.9±10.53, 85.12±8.83, 96.42±10.41 and 90.40±10.36 mmHg respectively after giving bolus drug before induction.

The MAP in control group (group I) increased significantly ($p<0.001$) just after intubation and at 1 min after intubation when compa red to pre-operative values. There after the MAP remained insignificantly high ($p>0.05$) during the intraoperative period and there was significant rise again at just after extubation.

Findings in clonidine group (group II) showed a significant ($p<0.001$) decrease in MAP just after intubation and throughout the intra operative period when compared to the pre-operative values.While comparing with control group and MgSO4 group (group III) there was a significant less rise ($p<0.001$) in MAP just after intubation and throughout the intra-operative period. When compared to esmolol group (group IV) there was significant less rise ($p<0.05$) in MAP only at just after intubation and 1 min after intubation and insignificant less rise ($p>0.05$) in MAP at 3, 5 and 10 min after intubation. After that the MAP remained significantly low ($p<0.05$) intra-operatively and just after extubation.

Findings in MgSO4 group (group III) showed a insignificant rise ($p>0.05$) in MAP just after intubation and 1 min after intubation

when compared to pre-operative values. When compared to control group there was significant less rise ($p<0.05$) only just after intubation and insignificant less rise ($p>0.05$) there after throughout the intra-operative period. In comparision to clonidine group and esmolol group the MAP was significantly high ($p<0.001$) in MgSO4 group just after intubation and throughout the intra-operative period.

Findings in esmolol group (group IV) showed a insignificant rise ($p>0.05$) in MAP only just after intubation and after that there was significant fall in MAP compared to pre-operative values. In comparison to control group and MgSO4 group there was significantly less rise ($p<0.001$) in MAP just after intubation and throughout the intra-operative period.

Bleeding and surgeon satisfaction score (Table 6) were also better in group II and group IV and statistically different ($p<0.001$) compared to group I and group III. Amount of bleeding and surgical field was better in group II compared to group IV, but the difference was not statistically significant ($p>0.05$).

Our results supported that clonidine and esmolol are better in controlling the rise in HR and MAP following laryngoscopy and intubation and the amount of bleeding and surgeon satisfaction score were also better in clonidine and esmolol group compared to MgSO4 and control group.

MgSO4 group was also found to be better than control group in controlling hemodynamics and reducing amount of bleeding, but the control was not that significant.

Table 1 Statistical Analysis of Systolic Blood Pressure (mmHg) in all four groups

Time	Group								P
	I		II		III		IV		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Pre Induction (T0)	123.15	6.29	122.35	8.97	127.20	10.53	132.60	12.49	0.005
After giving bolus drug before induction (T1)	118.80	25.72	112.95	8.51	125.25	12.00	119.30	12.20	0.126
Just After Intubation (T2)	134.00	7.65	106.15	11.12	123.25	15.18	116.90	15.36	<0.001
At 1 min intubation (T3)	128.70	9.04	103.75	11.91	126.00	20.70	108.65	11.22	<0.001
At 3 min intubation (T4)	125.55	8.51	102.60	9.88	119.35	14.59	107.00	18.13	<0.001
At 5 min intubation (T5)	123.65	8.97	102.55	9.73	117.75	13.42	103.40	11.65	<0.001
At 10 min intubation (T6)	122.35	6.68	103.60	8.14	117.40	12.51	104.55	13.16	<0.001
Intra-operatively (T7,8,9)	123.08	6.69	86.47	25.26	114.25	16.90	102.72	16.50	<0.001
Just After Extubation (T10)	135.10	7.59	114.75	13.69	133.30	9.34	119.50	13.05	<0.001

Table 2 Statistical Analysis of Diastolic Blood Pressure (mmHg) in all four groups

Time	Group								P
	I		II		III		IV		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Pre Induction (T0)	82.85	5.74	79.85	8.18	87.20	8.98	82.40	11.33	0.073
After giving bolus drug before induction (T1)	82.95	6.08	71.20	9.80	82.00	11.25	75.95	11.29	0.001
Just After Intubation (T2)	93.50	8.18	68.75	13.82	83.55	14.18	77.75	9.71	<0.001
At 1 min intubation (T3)	89.45	10.71	65.10	10.38	84.35	9.83	73.25	10.15	<0.001
At 3 min intubation (T4)	86.75	9.91	65.70	7.85	81.95	11.93	70.15	11.49	<0.001
At 5 min intubation (T5)	84.15	10.23	66.90	9.05	80.90	11.40	68.05	12.32	<0.001
At 10 min intubation (T6)	84.90	7.93	68.15	8.29	80.30	10.98	72.25	12.20	<0.001
Intra-operatively (T7,8,9)	85.88	6.45	58.48	17.01	78.82	12.00	69.03	13.74	<0.001
Just After Extubation (T10)	97.20	9.83	78.30	9.83	92.55	9.23	85.55	8.51	<0.001

Table 3 Distribution of Cases according to diagnosis in all four groups

Diagnosis	Group								Total	
	I	II	III	IV						
	No.	%	No.	%	No.	%	No.	%	No.	%
AC Polyp	2	10.0	5	25.0	0	-	8	40.0	15	18.8
Ausiofibroma	0	-	0	-	0	-	1	5.0	1	1.3
B/L Ethmoidal Polyp	0	-	0	-	1	5.0	0	-	1	1.3
B/L Nasal Polyp	6	30.0	3	15.0	2	10.0	5	25.0	16	20.0
Choanal Atresia	0	-	0	-	0	-	1	5.0	1	1.3
Chronic Rhinosinusitis	0	-	1	5.0	0	-	0	-	1	1.3
Chronic Sinusitis	2	10.0	0	-	3	15.0	0	-	5	6.3
DNS Lt Sertoplasia	0	-	1	5.0	0	-	0	-	1	1.3
Inverted Papilloma	0	-	0	-	1	5.0	0	-	1	1.3
Maxillary Sinusitus	0	-	0	-	1	5.0	0	-	1	1.3
Nasal Polyp	10	50.0	6	30.0	10	50.0	3	15.0	29	36.3
Parisinusitis	0	-	2	10.0	1	5.0	0	-	3	3.8
Polyp Nostril	0	-	0	-	0	-	1	5.0	1	1.3
Rhinitis	0	-	0	-	1	5.0	0	-	1	1.3
Rt Maxillary Sinusinusitis	0	-	1	5.0	0	-	0	-	1	1.3
Sinonasal Polyp	0	-	1	5.0	0	-	1	5.0	2	2.5
Total	20	100	20	100	20	100	20	100	80	100

Table 4 Statistical Analysis of Mean Arterial Pressure (mmHg) in all four groups

Time	Group								P
	I		II		III		IV		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Pre Induction (T0)	96.28	5.40	94.02	7.40	100.53	8.80	99.13	10.06	0.059
After giving bolus drug before induction (T1)	94.90	10.33	85.12	8.83	96.42	10.41	90.40	10.36	0.003
Just After Intubation (T2)	107.00	7.28	81.22	12.03	96.78	13.43	90.80	10.58	<0.001
At 1 min intubation (T3)	102.53	9.86	77.98	10.39	98.23	12.26	85.05	9.64	<0.001
At 3 min intubation (T4)	99.68	9.10	78.00	8.02	94.42	12.07	82.43	12.92	<0.001
At 5 min intubation (T5)	97.32	9.42	78.78	8.86	93.18	11.34	79.83	10.84	<0.001
At 10 min intubation (T6)	97.38	7.09	79.97	7.94	92.67	10.64	83.02	11.60	<0.001
Intra-operatively (T7,8,9)	98.28	6.29	67.81	19.64	90.63	13.31	80.26	14.52	<0.001
Just After Extubation (T10)	109.83	8.52	90.45	10.53	106.13	8.43	96.87	7.60	<0.001

Table 5 Statistical Analysis of Mean HR/min in all four groups

Time	Group								P
	I		II		III		IV		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Pre Induction (T0)	102.40	13.03	98.25	12.40	103.55	13.20	98.05	12.73	0.412
After giving bolus drug before induction (T1)	106.20	12.42	90.95	11.09	101.05	14.13	89.55	12.88	<0.001
Just After Intubation (T2)	116.80	10.20	91.80	14.01	102.35	9.57	89.95	9.81	<0.001
At 1 min intubation (T3)	112.25	5.90	89.35	12.40	102.00	7.89	90.60	10.50	<0.001
At 3 min intubation (T4)	108.00	5.97	86.50	11.01	100.00	7.83	84.90	8.74	<0.001
At 5 min intubation (T5)	107.15	7.24	84.25	11.43	98.20	9.56	82.80	9.09	<0.001
At 10 min intubation (T6)	103.75	6.99	83.15	11.98	100.20	24.88	82.15	14.38	<0.001
Intra-operatively (T7,8,9)	99.22	9.63	65.27	20.24	91.57	16.52	79.33	15.58	<0.001
Just After Extubation (T10)	113.95	6.78	83.90	11.29	102.95	9.02	90.65	9.84	<0.001

Table 6 Distribution of cases according to surgeon satisfaction score

Satisfaction Score	Group									
	I		II		III		IV		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Poor	6	30	0	-	0	-	0	-	6	7.5
Moderate	13	65	0	-	4	20	0	-	17	3
Good	1	5	4	20	9	45	6	30	20	25.0
Very Good	0	-	16	80	7	35	14	70	37	46.2
T0tal	20	100	20	100	20	100	20	100	80	100

DISCUSSION:

Endoscopy for diagnostic and operative purposes has become a common practice and it offers specific advantages to the patient. For endoscopic surgeries, a clear operative field is very essential and increased bleeding secondary to hypertension can cause difficulties with proper field visualization.[1] It is well known that laryngoscopy and tracheal intubation cause an increase in arterial blood pressure and heart rate transiently. Insertion of endoscope into the nasal cavity can also cause hemodynamic changes. As Endoscopic sinus surgery (ESS) is a delicate and time consuming procedure, it is performed under general anaesthesia. So anaesthesiologist have to plan the technique in such a way that will enable the operating team for achieving a bloodless field for better visualization of the intranasal structures and minimizing intraoperative bleeding.[2] Because very little bleeding can obstruct the view of the operating endoscope. Hence comes the role of controlled hypotension (MAP60-70 mmHg).[3],4Controlled hypotension is a technique that is used to limit intraoperative blood loss to provide the best possible field for surgery.5ESS has become one of the most common head and neck procedures performed. Proper anaesthetic plan management is essential for a successful outcome. Specific anaesthetic goals are to ensure the best possible surgical field and stable cardiovascular and respiratory status during surgery, emergence of anaesthesia, and upon recovery.[6]

CONCLUSION:

From this study the following conclusions can be drawn:

1. Inj. esmolol and inj. Clonidine are better in controlling the rise in HR caused due to laryngoscopy and intubation than inj. MgSO4. Inj. Esmolol had a better control over HR than inj. Clonidine.
2. Both inj. Clonidine and inj. esmolol are better in controlling the rise in MAP following laryngoscopy and intubation than MgSO4, with inj. Clonidine showing slightly better control of MAP than inj.esmolol.
3. Both inj. clonidine and inj. Esmolol maintain the hemodynamic stability during intra-operative period better than inj. MgSO4.
4. Intra-operative bleeding was minimum with inj. Clonidine, followed by inj. Esmolol compared to inj. MgSO4, during ESS.
5. Surgeon satisfaction score was better with inj. clonidine and inj. Esmolol than inj. MgSO4.

Thus from our study and observations, we can conclude that inj. Clonidine 2µg/kg i.v.given 5 min before induction followed by 1µg/kg/hr infusion is much more effective in controlling rise in both HR and MAP following laryngoscopy and intubation and maintains better hemodynamic stability and causes minimum bleeding throughout the intra-operative period. Effects of inj.esmolol 1mg/kg i.v., given just before induction followed by 0.6 mg/kg/hr infusion were also similar to clonidine and were better than inj. MgSO4, 30mg/kg iv bolus just before induction followed by 10 mg/kg/hr infusion. So in our study clonidine is a better drug than esmolol, which in turn is better than MgSo4 to attenuate the hemodynamic changes due to laryngoscopy and intubation, to maintain intra-operative hemodynamics and to minimise intra-operative bleeding during ESS, to maintain clear surgical field.

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