



ATTENUATION OF CARDIOVASCULAR STRESS RESPONSE TO TRACHEAL INTUBATION IN NORMOTENSIVE FEMALES.

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ABSTRACT

The overall results of present study have shown that none of the pretreatment drugs completely abolish the stress response to laryngoscopy and intubation but inj Esmolol 2mg/kg appeared to be the best option available in patients premedicated with midazolam further it doesn't prevent rise in blood pressure effectively. On combining both drug at dose Esmolol(1mg/kg) and Diltiazem(0.1mg/kg) although prevent the increase in SBP but not effectively prevent the HR response. Diltiazem 0.2mg alone doesn't prevent increase in HR than combination.

KEYWORDS: ASA-American society of Anaesthesiologists, ECG-Electrocardiography, SBP-Systolic blood pressure, MBP-Mean blood pressure, DBP-Diastolic pressure, HR-Heart rate. GA-general anaesthesia. LTI-Laryngoscopy and tracheal intubation.

INTRODUCTION

The stress response were recognized in 1951 by King et al^[1] during general anaesthesia since then number of pharmacological agents have been used to blunt the response of intubation. LTI are noxious stimuli that prove a transient but marked sympathetic stress response manifesting as increase in B.P.(40%-502%)^[2], tachycardia 20%^[2], cardiac arrhythmias^[2], increase in serum concentration of catecholamines, blood sugar and serum prolactin levels. However none of the drugs or technique has proved to be an ideal choice choice to control adrenergic response to laryngoscopy and intubation.

Among the sympatholytic agents both alfa and beta blockers have been used. Beta blockers^[3,4] have gained more popularity because of their significant effect on both blood pressure and HR response. CCB like diltiazem^[5,6] do not reliably obtund the heart rate^[7,8] responses although they usually obtund the B.P. Both CCB and betablocker in combination, together in a reduced dose are more effective than either drug alone to obtund the laryngoscopy and intubation.

MATERIAL AND METHOD

This prospective, randomized, double blind study was carried out in Deptt of Anaesthesia, Dr S.N. Medical college and Associated Groups of Hospitals, Jodhpur(Raj) (after taking approval from ethical committee) to observe the effect of inj Diltiazem 0.2mg/kg, or Inj. Esmolol1mg/kg. Cardiovascular stress

response to LTI in 100 normotensive female patients with age group of 30-60 yrs of ASA grade I & II. These patients were divided into 4 groups, consisted of 25 patients in each group. Group A patients received Inj. Normal saline 0.5% 5ml, 1 min. prior to laryngoscopy, group B received Inj. Diltiazem 0.2mg/kg bw in 5ml solution IV bolus 1 min. prior to laryngoscopy, group C received Inj. Esmolol 2mg/kg bw in 5ml solution IV bolus 1min prior to laryngoscopy and group D received Inj. Esmolol 1mg/kg bw and Inj. Diltiazem 0.1mg/kg bw in 5ml solution IV bolus 1 min prior to laryngoscopy. Only those patients were included in the study who had Mallampati grade I or II on airway examination and those patients with a history of cardiovascular disorder or had duration of laryngoscopy of more than 20 sec or had more than two attempts of laryngoscopy were excluded from the study. On arrival in OT and receiving peripheral IV line patients were premedicated with Inj Glycopyrrolate 0.01mg/kg BW, Inj ondansetron 4mg IV, Inj. Midazolam 0.02mg/kg bw and before induction. The oxygen saturation, NIBP and HR by ECG lead II were recorded.

After 5min of stabilization period, the patients were preoxygenated by 100% oxygen via mask for 3min. immediately before induction of anaesthesia (time=0), SAP DAP and HR were recorded as a baseline value. They received the pretreatment drug according to their drug allocation group 1min prior to the induction of anaesthesia. Anaesthesia was induced in rapid sequence manner with inj thiopentone 4mg/kg and Inj. Fentanyl

2ug/kg. Once the abolition of eye reflex appeared, LTI was facilitated with Inj. Suxamethonium. Laryngoscopy was attempted with medium size Mcintosh Laryngoscope blade and intubated with proper size endotracheal tube 1min. after suxamethonium.

After intubation and confirming the ETT placement by end-tidal CO₂ pressure monitoring at capnometer (bpl), ventilation was controlled with Bain Circuit and maintaining with 1% Isoflurane and 50% Nitrous Oxide with 50% Oxygen and muscle relaxation was maintained with vecuronium. All patients were observed for changes in hemodynamic (HR,SBP,DBP) at before induction, before intubation and immediately after intubation and thereafter at 1,3,5,10, and 15min after intubation. The values of above parameters before induction were considered as baseline value.

HEART RATE

The maximum rise in heart rate was 12.16%, 14.74%, 4.45% and 10.74% immediately after intubation in group A,B,C and D respectively. the rise in heart rate at 1min. was 15.70%, 17.35%, 2.72% and 7.98% in groups A,B,C and D respectively. At 3min. 11.13%, 6.93% and 5.32% rise was seen in A, B, and D respectively. On statistical comparison between group B vs C and B vs D, p-value was significant at 1min.

SYSTOLIC BLOOD PRESSURE

The maximum rise in systolic blood pressure was 24.52%, 11.31%, 6.55% and -3.74% from the base value in group A,B,C and D respectively. At immediately after intubation rise in systolic blood pressure was 22.94%, 9.42% and 5.34% in group A, B and C respectively. In group A rise was 8.71% at 3min after intubation while in other groups it showed a lower value than the base value upto 15min. On comparison between group B & D, significant p-value was observed only at immediately after intubation.

DIASTOLIC BLOOD PRESSURE

The maximum rise in diastolic blood pressure was 33.82%, 19.07%, 14.46% and 14.88% from the base value

in group A,B,C & D respectively immediately after intubation. At 1min. rise in diastolic blood pressure was 13.46% 6.16% 10.45% and 10.37% in group A,B,C & D respectively. At 3min. 8.43% rise was seen in group D. Thereafter 3min. in group A,B,C & at 5min, in group D values became near to its base value. On statistical comparison between group B & D, significant p-value was observed immediately and at 3,5,10,15min. after intubation more fall in diastolic blood pressure was noted.

MEAN BLOOD PRESSURE

The maximum rise in mean blood pressure was 29.19%, 16.12%, 10.26% & 6.86% in group A,B,C & D respectively. At 1min, rise was 17.74%, 8.34%, 7.78% and 2.87% in group A, B, C & D respectively. After 3min. the patients in group A,B C & D had shown a lower value of mean blood pressure than the base value upto 15 min. On statistical comparison between group B & D, significant p-value was observed upto 1min after intubation.

RATE PRESSURE PRODUCT

When a comparison was made amongst all groups at all times of observations a statistically significant difference was observed at immediately after intubation between group C and group D which was as a result of significant decrease observed in group D. As compared to group A (no pretreatment) all the drugs showed significant decreases in rate pressure product except at the baseline observations and at 10 and 15 min. of observation compared to esmolol pretreated group.

FINDINGS

Statistical analysis within groups was performed within groups using analysis of variance followed by Dunnett's test to compare test with control. Comparison between group was performed using analysis of variance followed by Bonferroni's modification t test.

Comparison of Mean Heart Rate (BPM) Among Group A, B,C & D

Stage	A vs B	A vs C	A vs D	B vs C	B vs D	C vs D
Before Induction	NS	NS	NS	NS	NS	NS
Before Intubation	NS	S	NS	S	NS	NS
After Intubation	Immediate.	NS	NS	NS	NS	NS
	1 min.	NS	S	NS	HS	S
	3 min.	NS	NS	NS	NS	NS
	5 min.	NS	NS	NS	NS	NS
	10 min.	NS	NS	NS	NS	NS
15 min.	NS	NS	NS	NS	NS	NS

Table shows the comparison of changes in mean heart rate per min. (bpm) among all four groups at various stages.

Comparison of Mean Blood Pressure(mm Hg) Among Group A, B,C & D

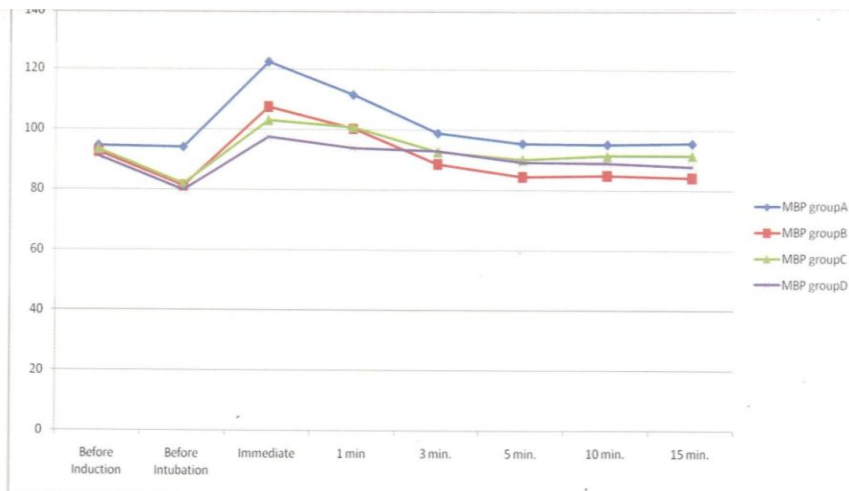
Stage	A vs B	A vs C	A vs D	B vs C	B vs D	C vs D
Before Induction	NS	NS	NS	NS	NS	NS
Before Intubation	HS	HS	HS	NS	NS	NS
After Intubation	HS	HS	HS	NS	HS	NS
1 min.	HS	HS	HS	NS	S	S
3 min.	HS	S	S	NS	NS	NS
5 min.	HS	S	S	S	S	NS
10 min.	HS	NS	S	S	S	NS
15 min.	HS	NS	HS	NS	NS	NS

Table shows the changes in mean blood pressure among all four groups at various stages.

P < 0.001 = HS

P < 0.05 = S

P > 0.05 = NS



Changes in mean blood pressure in all groups.

Comparison of Mean Diastolic Blood Pressure(mm Hg) Among Group A, B,C & D

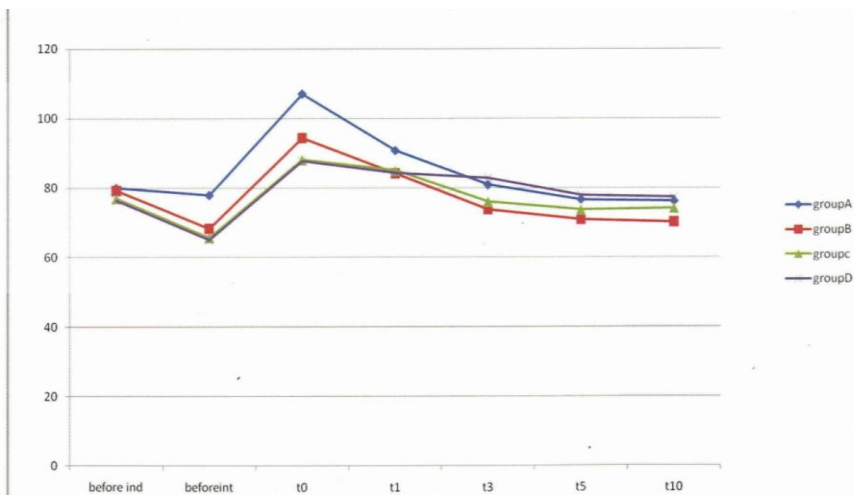
Stage	A vs B	A vs C	A vs D	B vs C	B vs D	C vs D
Before Induction	NS	NS	NS	NS	NS	NS
Before Intubation	HS	HS	HS	NS	NS	NS
After Intubation	HS	HS	HS	S	S	NS
1 min.	S	NS	S	NS	NS	NS
3 min.	S	NS	NS	NS	HS	S
5 min.	S	NS	NS	NS	S	NS
10 min.	S	NS	NS	NS	S	NS
15 min.	HS	NS	NS	NS	S	NS

Table shows the changes in mean diastolic blood pressure among all four groups at various stages.

P < 0.001 = HS

P < 0.05 = S

P > 0.05 = NS



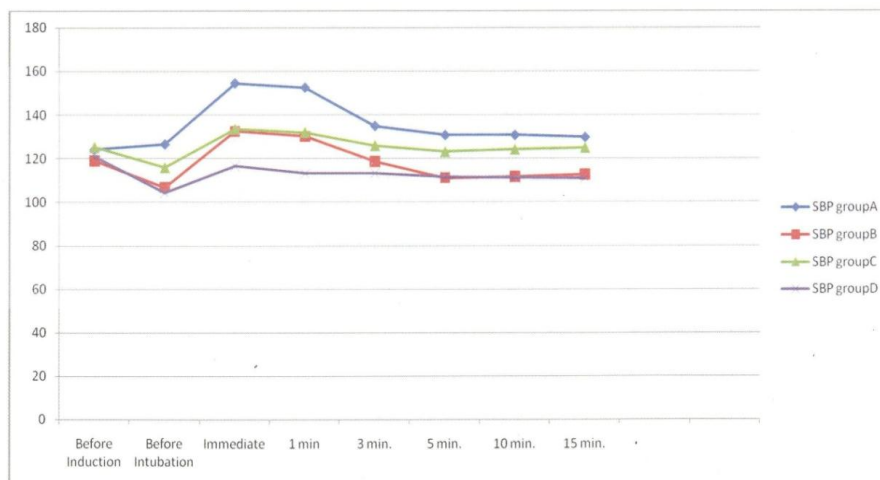
Changes in diastolic blood pressure in all groups.

Comparison of Mean Systolic Blood Pressure(mm Hg) Among Group A, B ,C & D

Stage	A vs B	A vs C	A vs D	B vs C	B vs D	C vs D
Before Induction	NS	NS	NS	NS	NS	NS
Before Intubation	HS	S	HS	NS	NS	NS
After Intubation	Immediate.	HS	HS	NS	S	S
	1 min.	HS	HS	NS	NS	NS
	3 min.	HS	NS	HS	NS	S
	5 min.	HS	S	HS	HS	NS
	10 min.	HS	NS	HS	HS	NS
	15 min.	HS	NS	HS	HS	NS

Table shows the changes in mean systolic blood pressure among all four groups at various stages.

P < 0.001 = HS
 P < 0.01 = S
 P > 0.05 = NS



Changes in Systolic blood pressure in all groups

DISCUSSION

It was interesting to note that LTI may be associated with the increase in arterial blood pressure, heart rate and dysarrhythmias. These changes are well tolerated by

young and fit patients but may be hazardous to those with patients who are having unstable cardiovascular systems hence a lot of studies with different agents have been taken to evaluate the cardiovascular changes and

further to attenuate these changes associated with laryngoscopy and intubation.

In the present study where the abolition of heart rate and blood pressure response to LTI by different drugs and their combination was observed. None of the pretreatment completely abolishes the adrenergic response to laryngotracheal intubation, in the present study the best option amongst the study groups was either the combination of Inj Diltiazem(0.1mg/kg) with inj esmolol(2mg/kg) or Inj Esmolol 2mg/kg alone.

In case of diltiazem our findings are consistent with that of Mikawa *et al*(1990)^[5] who studied the efficacy of Diltiazem in the attenuation of cardiovascular response to laryngoscopy and observed that Diltiazem failed to prevent tachycardia caused by LTI. But arterial pressure began to decline 20-40 sec after administration of drug. Mikawa *et al* (1996)^[9] in their comparative study of nicardipine, verapamil and diltiazem found that rise of SBP and DBP was significantly lower in the Diltiazem(0.2g/kg) group as compared to control group 1 min prior to laryngoscopy. Also this response is significantly attenuated after laryngoscopy all the times.

In case of Esmolol our results are in accordance with Ugur *et al*(2007)^[10] who has comparative study of effects of Lignocain(1.5mg/kg), Fentanyl (1ug/kg) Esmolol(1.5mg/kg) on hemodynamic response to and LTI and observed that compared with control group heart rate decreased significantly after induction and 1min after intubation($p < 0.0083$). Fernandez *et al* (2004)^[11] in a comparative study of alfentanyl, clonidine and esmolol when used as adjuvant during GA observed that the MAP changed significantly after intubation in clonidine and alfentanyl gp but not in esmolol gp.

In case of combination (gp D) our coincides with the study of John Atlee (2000).^[12] They study the effects of esmolol and Nicardipine on hemodynamic changes after LTI. And observed that compared with no pretreatment before the IV induction of GA, the peak increase in BP after LTI is best blunted by the combination of nicardipine and ESM, compared with either drug alone. No single drug or combination in the doses tested opposed increase HR. No single drug or combination in the doses tested opposed increased HR. Hence they concluded that compared with no pretreatment before the IV induction of GA, the peak increase in BP after LTI is best blunted by the combination of nicardipine and esmolol, compared with drug alone. No single drug or combination in the doses tested opposed increased heart rate.

CONCLUSION

Hence it can be concluded that none of the pretreatment drugs completely abolish the stress response to LTI. Injection Esmolol 2mg/kg appeared to be the best option available, in patients premedicated with midazolam though concern has to be kept in mind for bradycardia,

further it does not prevent rise in blood pressure effectively.

Combining both the drugs although prevented the increase in systolic blood pressure there was a tendency of hypotension beyond 5min. of laryngotracheal intubation and does not effectively prevent the heart rate response. The same applies for calcium channel blocker Inj. Diltiazem alone as it leads to more increase in heart rate than combination.

However combination of two drugs, esmolol in higher doses (2mg/kg) than used 1mg/kg as well as premedication with midazolam and fentanyl may be investigated.

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