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The Effect of Intravenously Administered Dexmedetomidine on Haemodynamic Response to Intubation in Patients Undergoing Surgery Under General Anaesthesia

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Abstract

Back ground: This study took for comparing efficacy of IV Dexmedetomidine 0.5µg/kg and IV Dexmedetomidine 1µg /kg in obtunding the hemodynamic response to laryngoscopy and endotracheal intubation when administered 10 minutes before induction.

Methodology: A Ninety patients scheduled for various elective and emergency surgical procedures under general anesthesia belonging to ASA class I & II and Mallampati grade I & II in the age group of 18 years to 60 years were included in the study.

The study population was randomly divided into three groups group A received normal saline and represent as control , group B received IV Dexmedetomidine in a dose of 0.5µg/kg, group C received IV Dexmedetomidine in a dose of 1µg/kg

The HR, SBP, DBP and MAP were recorded at the following intervals, namely, basal reading before giving the study drug, at 5 minute intervals from the end of drug infusion until induction, post induction/ pre-laryngoscopy and at 1, 2.5, 5, 10, 15 and 20 minutes following tracheal intubation.

Results : Analysis of the post induction and post intubation values of mean HR and MAP variation from the baseline values in the Group B and C depicts a statistically significant difference ($p < 0.001$). Between the two groups with the Group C demonstrated a greater suppression of HR and MAP to intubation. There was no clinically significant difference between the two doses of the study drug in their efficacy.

Conclusion : Dexmedetomidine in a dose of 0.5µg/kg, significantly attenuates the hemodynamic response to laryngoscopy and intubation for 10 minutes ($p<0.001$) with minimal adverse effects.

Keywords:- *Dexmedetomidine, Hemodynamic Response.*

I. INTRODUCTION

- Laryngoscopy and endotracheal intubation is often associated with hypertension and tachycardia because of sympatho-adrenal stimulation which is usually transient and lasts for about 5-10 minutes.
- In patients with cardiovascular and cerebrovascular diseases, the sudden hemodynamic response can produce deleterious effects in the form of myocardial ischaemia or infarction, arrhythmias, cardiac failure, raised ICP and cerebral haemorrhage.
- In view of this, the present study was undertaken to compare the efficacy of IV Dexmedetomidine 0.5µg/kg and IV Dexmedetomidine 1µg /kg in obtunding the hemodynamic response to laryngoscopy and endotracheal intubation when administered 10 minutes before induction.

II. AIMS AND OBJECTIVES

Aim of the study is to evaluate and compare the efficacy of IV Dexmedetomidine 0.5µg/kg and IV Dexmedetomidine 1µg /kg in attenuating the adverse hemodynamic responses to laryngoscopy and endotracheal intubation when infused over 10 minutes, 10 minutes before induction.

III. MATERIALS AND METHODS

- This is a prospective double blinded study .
- A Ninety patients scheduled for various elective and emergency surgical procedures under general anesthesia belonging to ASA class I & II and Mallampati grade I & II in the age group of 18 yrs to 60 yrs were included in the study.
- The study population was randomly divided into three groups Group A – (n=30) – received IV Normal saline 20ml administered over 10 minutes, 10 minutes before induction of anesthesia.
- Group B– (n=30) – received IV Dexmedetomidine in a dose of 0.5µg/kg diluted in 20ml of normal saline infused over 10 minutes, administered 10 minutes before induction of anesthesia.

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- Group C- (n=30)-received IV Dexmedetomidine in a dose of 1µg/kg diluted in 20ml of normal saline infused over 10 minutes, administered 10 minutes before induction of anesthesia.
- All patients were premedicated with Inj Ondansetron 0.08mg/kg IV and Inj Fentanyl 2µg/kg IV prior to induction. Anesthesia was induced after the administration of the study drug using Inj Propofol IV titrated to the loss of verbal response.
- This was followed by Inj Atracurium 0.5mg/kg IV. Laryngoscopy and endotracheal intubation was done after 3 minutes.
- The HR, SBP, DBP and MAP were recorded at the following intervals, namely, basal reading before giving the study drug, at 5 minute intervals from the end of drug infusion until induction, post induction/ pre-laryngoscopy and at 1, 2.5, 5, 10, 15 and 20 minutes following tracheal intubation.

➢ *Statistical Analysis*

Descriptive and inferential statistical analysis has been carried out . Results on continuous measurements are presented on Mean SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

Analysis of variance (ANOVA) has been used to find the significance of study parameters between three or more groups of patients , Post-hoc Tukey test has been used to find the pair wise significance.

Statistical soft ware namely SAS9.2,SPSS15.0 were used for analysis of data.

IV. RESULTS

Table 1 : comparison of heart rates between study groups

Heart rate (bpm)	Group A	Group B	Group C	Significance		
				A-B	A-C	B-C
10 Min Before Sx	84.60±12.73	85.33±13.34	81.13±11.97	0.973	0.543	0.409
Post Induction	84.60±12.14	63.07±8.65	62.93±7.14	<0.001**	<0.001**	0.999
1 Min after Induction	102.10±16.04	59.53±7.70	64.10±8.26	<0.001**	<0.001**	0.267
2.5 Minutes	97.23±36.76	60.37±8.54	53.73±4.32	<0.001**	<0.001**	0.473
5 Minutes	85.07±12.96	55.70±5.50	54.83±4.09	<0.001**	<0.001**	0.917
10 Minutes	82.13±11.29	55.67±4.93	55.20±3.34	<0.001**	<0.001**	0.967
15 Minutes	77.77±11.92	55.57±4.33	55.67±3.32	<0.001**	<0.001**	0.999
30 Minutes	78.20±8.66	55.70±3.26	58.23±4.68	<0.001**	<0.001**	0.235

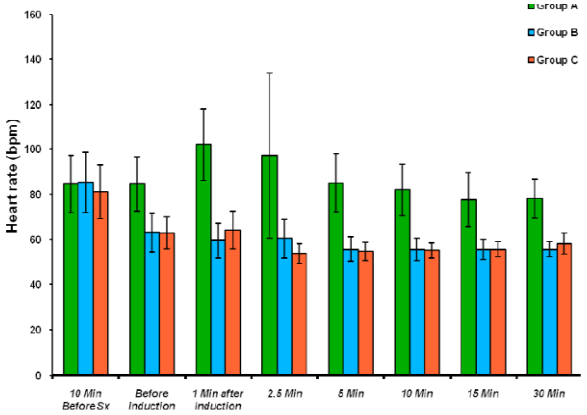

Fig 1: comparison of heart rates between study groups

- In group A(control) the mean HR was 84.60±12.73, which didn't change with administration of control drug. Post induction of anesthesia HR was 84.60±12.73. Post Intubation there was a rise in the mean heart rate values from the base line value by 17.5b/min at 1 minute, 12.63b/min at 2.5 minutes, 0.47b/min at 5 minutes, 2.47b/min at 10 minutes, finally returning close to pre-laryngoscopic values at 10 minutes.The maximum rise of heart rate was at 1 minute.
- In group B(Dexmedetomidine 0.5µg) the mean base line HR was 85.33±13.34 which decreased by 22.26 following induction. Post Intubation there was a mean decrease in the HR values from the base line values by 25.98b/min at 1minute, 24.96b/min at 2.5minutes, 29.63b/min at 5minutes, 29.66b/min at 10minutes, 29.82b/min at 15minutes
- In group C(Dexmedetomidine 1µg) the mean base line HR was 81.13±11.97 which decreased by 18.17 following induction. Post Intubation there was a mean decrease in the HR values from the base line values by 17.03 at 1minute, 27.9b/min at 2.5minutes, 26.3b/min at 5minutes 25.93b/min at 10minutes, 25.56b/min at 15minutes.

- Both study groups(B & C) were comparable with respect to there HR at base line, 1 minute, 2.5 minutes, 5 and 10 minutes after administration of the study drug. There was a statistically significant difference between the two study groups when compared to the control group with regard to their HR values(p values being <0.01). Group C(Dexmedetomidine 1µg) demonstrated a greater suppression of chronotropic response to intubation as compared to other groups.
- Comparison between the two groups demonstrated that there was no statistically significant difference between the mean HR values of the two groups upto 15 minutes after the administration of the study drug.
- Thus it may be said that there was no clinically significant difference between the two study drugs in their efficacy to attenuate the chronotropic response to intubation. But when compared to control group there was a significant difference and clinically signifiacant suppression of HR.

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- In group B 4 patients required treatment for bradycardia, where as in group C, 11 patients required treatment for bradycardia.

Table 2 : comparison of mean arterial pressure among study groups

MAP mmHg	Group A	Group B	Group C	Significance		
				A-B	A-C	B-C
10 Min Before Sx	78.38±11.59	76.04±11.88	78.00±11.40	0.718	0.991	0.792
Before Induction	73.47±11.38	59.04±9.24	62.58±8.22	<0.001**	<0.001**	0.340
1 Min after Induction	90.00±14.28	55.78±8.46	66.76±11.66	<0.001**	<0.001**	0.001**
2.5 Minutes	79.82±15.99	56.96±5.82	61.58±6.70	<0.001**	<0.001**	0.213
5 Minutes	67.53±15.82	56.24±5.67	58.24±4.87	<0.001**	0.002**	0.724
10 Minutes	62.98±15.65	59.76±5.56	59.78±7.58	0.466	0.471	1.000
15 Minutes	67.44±12.64	62.47±5.28	59.29±6.13	0.072+	0.001**	0.335
30 Minutes	70.98±12.35	66.02±5.27	66.33±7.82	0.088+	0.117	0.990

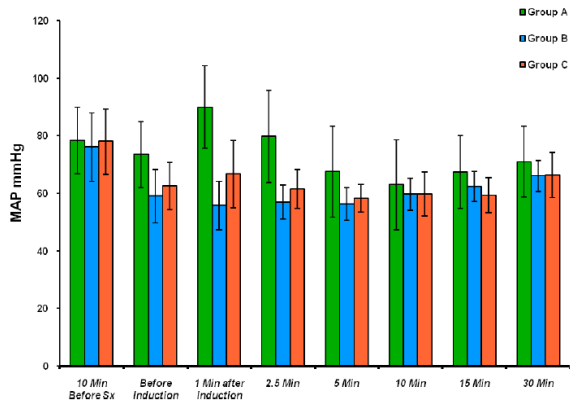

Fig 2 : comparison of mean arterial pressure among study groups

- In Group A control, the mean base line MAP was 78.38±11.59 which decreased by 4.91mmHg after induction of anesthesia. Post intubation there was a rise in mean MAP values from the base line values 11.62mmHg at 1minute, 1.44mmHg at 2.5minutes, decreased by 10.85mmHg at 5minutes, finally returning close to prelaryngoscopic values at 10minutes. The maximum rise in MAP was at 1minute.

- In Group B, the mean base line MAP was 76.04±11.88 which decreased by 17mmHg after induction of anesthesia. Post intubation there was a decrease in mean MAP values from the base line values 20.26mmHg at 1minute, 19.08mmHg at 2.5minutes, decreased by 19.8mmHg at 5minutes, 16.28mmHg at 10minutes, 13.57mmHg at 15minutes. The mean MAP values persistently remained low throughout observation. At no point of time during the post induction period did the mean MAP rise above the base line mean MAP value of the study population in this group. The maximum fall of MAP was at 1minute post induction.
- In Group C, the mean base line MAP was 78.00±11.4 which decreased by 15.42mmHg after induction of anesthesia. Post intubation there was a decrease in mean MAP values from base line values 11.24mmHg at 1minute, 16.42mmHg at 2.5minutes, decreased by 19.76mmHg at 5minutes, 18.22mmHg at 10minutes, 18.71mmHg at 15minutes.
- The mean MAP values persistently remained low throughout observation. At no point of time during the post induction period did the mean MAP rise above the base line mean MAP value of the study population in this group. The maximum fall of MAP was at 5minutes post intubation.
- Comparison between the two groups demonstrated that there was no statistically significant difference between the mean MAP values of the two groups upto 10 minutes after the administration of the study drug.
- Thus it may be said that there was no clinically significant difference between the two study drugs in their efficacy to attenuate the pressor response to tracheal intubation .But when compared to control group there was a significant difference clinically and statistically.
- In group II 4 patients required treatment for hypotension, where has in group III, 11 patients required treatment for hypotension

CONCLUSION

- Analysis of the post induction and post intubation values of mean HR and MAP variation from the baseline values in the Group B and C depicts a statistically significant difference ($p < 0.001$). Between the two groups with the Group C demonstrated a greater suppression of HR and MAP to intubation. There was no clinically significant difference between the two doses of the study drug in their efficacy.
- Dexmedetomidine in a dose of 0.5µg/kg, significantly attenuates the hemodynamic response to laryngoscopy and intubation for 10 minutes ($p<0.001$) with minimal adverse effects.

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