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Original Article

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Effects of Intravenous Clonidine and Intravenous Dexmedetomidine in Attenuation of Hemodynamic Response to Direct Laryngoscopy and Tracheal Intubation

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ABSTRACT

Introduction: Laryngoscopy is performed to facilitate tracheal intubation which is a day to day routine in the practice of anaesthesiology. Both laryngoscopy and intubation are associated with physiological response such as sympathoadrenal response inducing tachycardia and hypertension.

Aim: To study the effects of intravenous clonidine and intravenous dexmedetomidine in attenuation of hemodynamic response to direct laryngoscopy and tracheal intubation. The objectives of the study are: to compare hemodynamic changes of intravenous clonidine and intravenous dexmedetomidine among patients undergoing direct laryngoscopy and tracheal intubation in elective surgeries under general anaesthesia and to observe any adverse drug reactions.

Materials and methods: This study was a hospital based observational study carried out in Jorhat Medical College and Hospital during July 2020 to June 2021.90 patients were divided alternatively into two groups.

Result: Statistically significant difference in mean heart rate was observed at during laryngoscopy and intubation and at time 1 minute after laryngoscopy. A statistically significant difference was observed in mean systolic blood pressure between the two groups at time of laryngoscopy and intubation and at all times following intubation. Mean diastolic blood pressure had significantly difference during laryngoscopy and intubation and at all times following intubation. Mean of mean arterial pressure had statistically significant difference in both the groups at all observations following intubation.

Conclusion: Both clonidine 1 mcg/kg and dexmedetomidine 1 mcg/kg attenuated the hemodynamic response to laryngoscopy and intubation but dexmedetomidine is a better choice than clonidine in attenuating the hemodynamic response to direct laryngoscopy and intubation.

Key Words: *Laryngoscopy, Intubation, pressor response, clonidine, dexmedetomidine*

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INTRODUCTION

Laryngoscopy is performed to facilitate tracheal intubation which is a day to day routine in the practice of anaesthesiology. Both laryngoscopy and intubation are associated with physiological response such as sympathoadrenal response inducing tachycardia and hypertension [1]. These changes are well tolerated by normal healthy individuals. But in case of susceptible individuals having cardiovascular and cerebrovascular disease sudden rise of heart rate and blood pressure can have deleterious effects such as intraoperative myocardial infarction, acute left ventricular failure, arrhythmias and intracranial bleed [2]. Intravenous anaesthetic inducing agents do not adequately decrease the pressor responses due to tracheal intubation [3]. Various pharmacological and non pharmacological methods have been tried to decrease this pressor response. Clonidine and dexmedetomidine, both are alpha 1 and alpha 2 receptor agonist and has become popular agents for obtunding hemodynamic responses to laryngoscopy and intubation.

Dexmedetomidine is a highly selective centrally acting, potent alpha 2 adrenergic agonist with less duration of action. Alpha 2 to alpha 1 selectivity for dexmedetomidine is 1620:1 compared to clonidine which is only 220:1 [4]. Its advantages include sedation, analgesia, anxiolysis and improved hemodynamic stability by activation of alpha 2 receptors located in the postsynaptic terminals in the central nervous system, causing augmentation of vagal activity [5].

Clonidine and dexmedetomidine both have been known to blunt sympathetic responses to tracheal intubation. Very few studies have been done in the state of Assam and adjoining north eastern states comparing injection clonidine and injection dexmedetomidine in attenuating sympathetic responses to laryngoscopy and intubation. Therefore, we have undertaken our present study to compare the effectiveness of injection clonidine and injection dexmedetomidine in attenuating the hemodynamic responses to laryngoscopy and tracheal intubation.

MATERIALS AND METHODS

Ninety patients scheduled for various elective surgical procedures under general anaesthesia in general surgery ward were included in the study.

Study design- Hospital based observational study.
Study setting- Jorhat medical College and Hospital
Study duration- One year.
Study population- Patients admitted in General Surgery ward of Jorhat Medical College and Hospital for elective surgery under general anaesthesia within the study period.

Sample size-Considering 95% confidence interval and power of 80%,and taking the findings of the study by Kaur B et al. [5] as reference, the sample size for the present study is 45 in each of two groups which is calculated using the formula, Sample size=$2\sigma 2\ (z\beta+z\alpha/2)2/\Delta 2$ Where σ is standard deviation (7.05), zβ is power (80%) zα/2 =1.96 Δ is mean difference (4.06)

Sampling technique-Consecutive sampling

Inclusion criteria for the study

1) Patients who are wiling to give written informed consent.
2) ASA Grades I and II patients.
3) Patients aged between 18 and 60 years of both the sex.
4) Mallampati grade I and II.
5) Elective surgery for general anaesthesia.

Exclusion criteria for the study

1) Patients with cardiac, coronary, renal, hepatic, cerebral disease and peripheral vascular diseases, psychiatric disease and alcoholism.
2) Patients with heart rate less than 60 beats per minute, baseline blood pressure less than 100/50 mm Hg.
3) Patient with anticipated difficult airway and intubation duration more than 15 seconds.
4) Presence of 1st, 2nd or 3rd degree block.
5) Pregnant and lactating mother.

Patients who met the inclusion and exclusion criteria of the study were selected consecutively. They were then divided alternatively into two groups, Group A and Group B. Each group had an equal number of 45 each. Group A-Clonidine group (n=45) received 1 µ g/kg intravenous clonidine in 20 ml normal saline over 10 minutes and 10 minutes prior to laryngoscopy and intubation.

Group B-Dexmedetomidine group (n=45) received 1 µ g/kg intravenous dexmedetomidine in 20 ml normal saline over 10 minutes and 10 minutes prior to laryngoscopy and intubation.

Ethical Clearance:

Ethical clearance was obtained from the Institutional Ethics Committee (H) of Jorhat Medical College & Hospital.

Consent:

Written and informed consent was taken from all patients. Study variables: **1**.Heart Rate **2**.Systolic Blood pressure **3**.Diastolic blood pressure **4**.Mean Arterial Pressure **5**.Continuous ECG in Lead II **6**.Any adverse drug reactions Study variables were recorded at an interval of 5 minutes till 15 minutes from intubation. Anaesthesia was maintained on N20 +O2, Sevoflurane, atracurium. Intravenous fluids were administered as per requirement. At the end of surgical procedure, patients were reversed and extubated and shifted to the recovery room.

Statistical Analysis

Data were presented as frequency, percentage and mean± standard deviation. The statistical analysis was done using the Microsoft Excel 2010 and Microsoft Word 2010. Results on continuous measurements were compared using student t test. Discrete data were analyzed using chi square test. For all analysis, the statistical significance was fixed at 5% (p value<0.05)

RESULTS

Table 1: Comparison of mean age, weight, gender, ASA and mallampati status distribution in both groups

Variables	Group A	Group B	P value	Association
Age (mean±SD)	36.00±9.94	39.38±10.88	0.1276	NS
Weight (mean ±SD)	60.80±7.89	58.36±7.02	0.1398	NS
Gender (in percentage)	Male=28.89% Female=71.11%	Male=26.67% Female=73.33%	0.8139	NS
ASA status (in percentage)	I=71.11% II=28.89%	I=62.22% II=37.78%	0.3710	NS
Mallampati status (in percentage)	I=55.56% II=44.44%	I=51.11% II=48.89%	0.1786	NS

P<0.05 is signficant. NS means not significant.

Mean age, weight, gender, ASA status and mallampati status distribution showed no significant differences.

1. Haemodynamic parameters

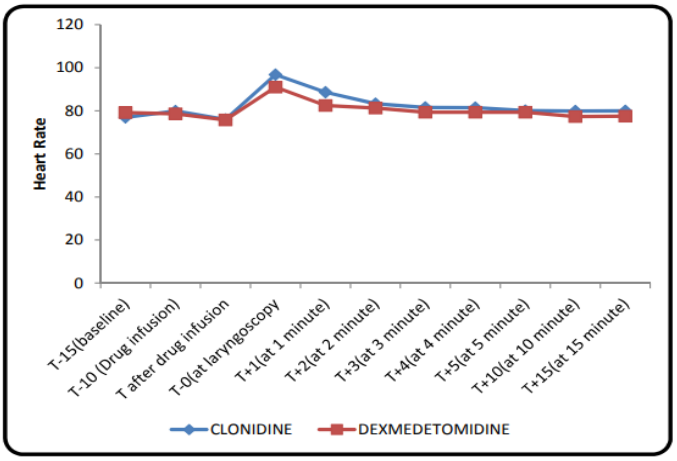

Fig 1: mean heart rate comparison

The figure shows the baseline mean HR was statistically insignificant. Both the groups showed lowering of HR after test drug administration which was however statistically insignificant. Statistically significant difference in HR was observed at during laryngoscopy and intubation and at time 1 minute after laryngoscopy. However, HR of both the groups were found statistically insignificant at time 2 minute, 3 minute, 4 minute, 5minute 10 minute and 15 minutes after laryngoscopy and intubation.

2. Systolic Blood pressure

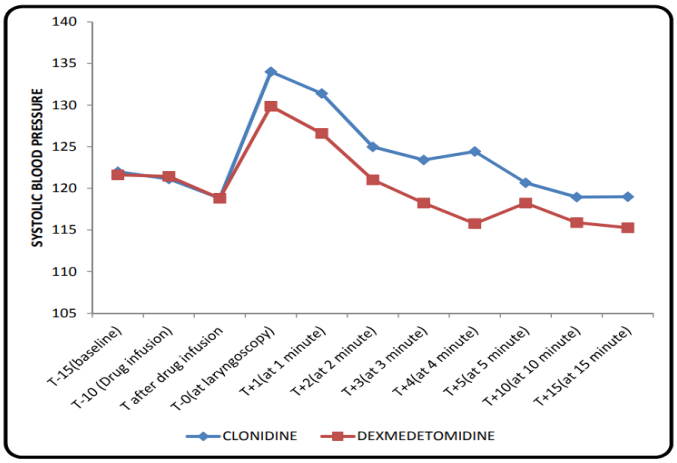

Fig 2: Mean systolic blood pressure comparison

The above figure shows the baseline mean systolic blood pressure was statistically insignificant. Both the groups had fall in mean systolic blood pressure after test drug administration which was however statistically insignificant. A statistically significant difference was observed in mean systolic blood pressure between the two groups at time of laryngoscopy and intubation and at all times following intubation.

3. Diastolic blood pressure

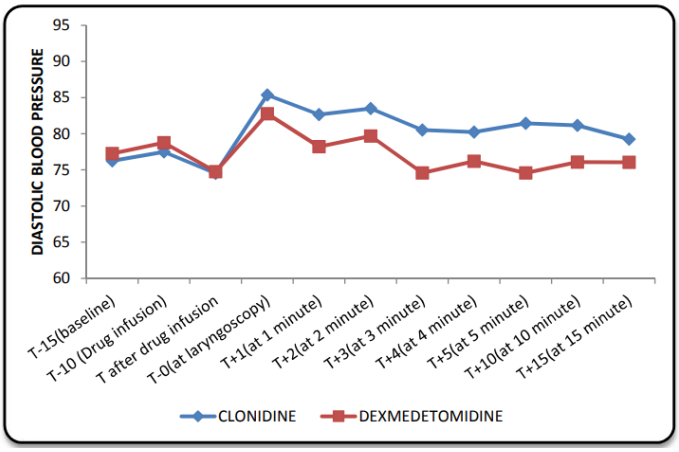

Fig 3: Mean diastolic blood pressure comparison

Statistically significant difference in mean diastolic blood pressure was observed during laryngoscopy and intubation and at all times following intubation.

4. Mean arterial pressure

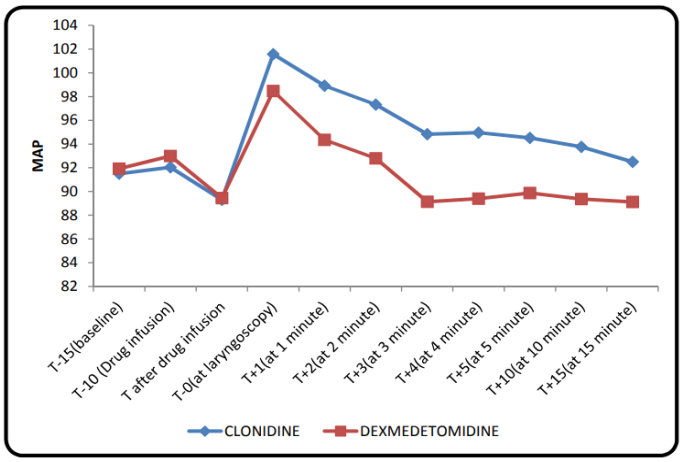

Fig 4: Mean of mean arterial pressure comparison

There was statistically significant difference in both the groups at all observations following intubation.

Adverse Drug Reactions

In our study, no patient had bradycardia (HR<50 per minute), hypotension (SBP<90 mm Hg or DBP<60 mm Hg or MAP <50 mm Hg), arrhythmia or any other adverse drug reactions.

DISCUSSION

Laryngoscopy and intubation are associated with a transient rise in hemodynamic stress response such as heart rate and blood pressure. This sudden increase may cause wide variety of complications such as imbalance of myocardial oxygen demand supply, ventricular arrhythmia and cardiac failure. This is hazardous particularly to those with hypertension, myocardial insufficiency or cerebrovascular diseases. Different techniques or methods are studied in time to time to reduce these reflexes. In the present work, we are using two drugs Clonidine and Dexmedetomidine which are both alpha 2 agonists. Dexmedetomidine is a highly selective alpha 2 adrenoceptor agonist with alpha 1: alpha2 selectivity ratio of 1:1620 whereas clonidine is a partial alpha adrenergic receptor agonist with selectivity ratio of alpha 2: alpha1 is 220:1. Keeping the pharmacologic properties in mind, Clonidine and Dexmedetomidine drugs were selected for our present study to attenuate the hemodynamic response during laryngoscopy and intubation.

Dexmedetomidine 0.5 mcg/kg intravenous was found superior to clonidine in attenuating haemodynamic response during laryngoscopy and intubation (Kaur B et al). Kaliannan SK et al [6]. Used 2 mcg/kg injection clonidine and 1 mcg/kg injection dexmedetomidine over 20 minutes before laryngoscopy. They concluded that dexmedetomidine produced better attenuation of intubation response when compared to clonidine.

Our findings correlate with the studies conducted by Kaur B et al [5], Yadav AR et al [7], Borah B et al [8] and Hussain SY et al. [9].

There were no incidences of hypotension, bradycardia or other adverse drug reactions in our study which is also comparable with the findings of Kaur B et al and Borah B et al.

Limitations of our study

- Invasive blood pressure monitoring was not done.
- Plasma catecholamine levels were not assessed.
- Depth of anaesthesia was not measured using Bispectral index.

CONCLUSION

Both dexmedetomidine and clonidine attenuated the hemodynamic response to laryngoscopy and intubation. But dexmedetomidine maintained a better hemodynamic profile than clonidine without any adverse drug reactions. Hence we can conclude that dexmedetomidine 1 mc g/kg is a better agent than clonidine 1 mcg/kg for attenuation of hemodynamic response to laryngoscopy and tracheal intubation

Conflict of interest-none

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