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Comparative study of two different doses of dexmedetomidine for attenuation of pressure response during induction of anaesthesia

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Abstract

Background: We studied two different doses of Dexmedetomidine in two groups, one group was receiving 0.5 µg/kg of injection Dexmedetomidine and another group was receiving 1 µg /kg of same drug for attenuation of pressure response during induction of anaesthesia.

Material and Methods: Patient's heart rate, blood pressure, mean arterial pressure and saturation were recorded at preinduction level, 60 seconds after Dexmedetomidine infusion (T1), 60 seconds after induction (T2), 60 seconds after intubation (T3), and 5 minutes after intubation (T4). If hypotension (reduction of blood pressure 30% of baseline or more) occurs, it was treated initially with increasing intravenous fluid and then reducing dose of inhalational agents. Afterwards if not improved then intravenous Ephedrine was given. For bradycardia (heart rate less than 45 beats per minute) was treated with 0.5 mg bolus dose of injection Atropine.

Results: Our study shows that HR were decreased at T2, T3, and T4 level in group II as compare to group I.

SAP and MAP shows significant difference in both groups. It was reduced significantly in group II as compare to group I at T1 to T4 level.

Conclusion: Our results found that injection Dexmedetomidine 1µg/kg was effective to attenuate the pressure response during induction of anaesthesia more than 0.5 µg/kg of drug.

Keywords: Dexmedetomidine, attenuation, induction of anaesthesia, heart rate, blood pressure, mean arterial pressure.

Introduction

The pressure response to tracheal intubation resulting in increased heart rate and blood pressure. Many drugs are available to attenuate pressure response, like opioids, vasodilators, β-blockers or by deep plane of anaesthesia.

Dexmedetomidine is a highly selective and potent α2 adrenoceptor agonist. It is analgesic, has anesthetic sparing effect, sympatholytic property, useful in other procedural procedure and also has cardiovascular stability. It reduces delirium and preserves respiratory functions which adds benefits to its uses.

The aim of our study to investigate the effects of two different doses of injection Dexmedetomidine for attenuating pressure response to endotracheal intubation.

Methods

After obtaining Ethical approval and written informed consent, we studied 60 ASA grade I or II patients age group 18-60 years undergoing elective surgery. We excluded those patients who has having previous history of difficult intubation, failed intubation, the patient who had history of high blood pressure and cardiovascular diseases. Randomized distribution of patients were done, one group A was receiving 0.5 µg/kg of Dexmedetomidine drug and group B was receiving 1µg/kg of same drug. Baseline measurement of heart rate, blood pressure and saturation was recorded.

After taking patient in Operation Theater, noninvasive monitors applied like three lead ECG, blood pressure and saturation probe. Intravenous cannula was secured in dorsum of hand for administration of drugs.

Patient was preoxygenated with 100% oxygen via face mask for three minutes. Premedication drugs was given. Injection Dexmedetomidine infusion started slowly, after 90 seconds, injection Thiopental sodium 5mg/kg as an induction agent was given. For ease of intubation short acting muscle relaxant injection Succinylcholine was given. Patient was intubated with appropriate size of endotracheal tube and for maintenance of anaesthesia, long acting muscle relaxant and inhalational agent was used.

According to our study measurements of SBP, DBP, MAP, HR and SPO2 were recorded 60 seconds after Dexmedetomidine infusion (T1), 60 seconds after induction (T2), 60 seconds after intubation (T3), and 5 minutes after intubation (T4). If hypotension (reduction of blood pressure 30% of baseline or more) occurs, it was treated initially with increasing intravenous fluid and then reducing dose of inhalational agents. Afterwards if not improved then intravenous Ephedrine was given. If bradycardia (heart rate less than 45 beats per minute) occurs, it was treated with 0.5 mg bolus dose of injection Atropine.

Statistical Analysis

The sample size was determined by power analysis performed by a pilot study. A sample size of 30 patients per group was required to detect a (20%) change in heart rate, blood pressure with a power of 80%. Statistical tests were performed using SPSS version 12.0. Independent t-test was used to compare the study

group and the control group.* represent significant difference and NS represents non-significant difference between two groups.

Table 1: Demographic data

	Group I (N=30)	Group II (N=30)
Age(years)	41.1±9.22	40.53 ±9.12
Weight(kg)	60 ±11.2	58 ±24.3
ASA I	30%	30%
II	0%	0%
Mallampati I	21(70.0%)	22(73.3%)
II	9(30.0%)	8(26.7%)

N= number of patients.

Table 2: HR comparison

	Group-1 (N=30)	Group-2 (N=30)	p-value
Preinduction	81.90±5.82	83.40±3.99	0.25 (NS)
T1	85.27±5.60	83.70±3.11	0.19 (NS)
T2	92.30±6.97	74.87±5.35	<0.01*
T3	89.50±6.37	72.00±4.76	<0.01*
T4	87.07±5.99	70.70±3.79	<0.01*

N= number of patients.

Table 3: Systolic Blood Pressure (mmHg)

	Group-1 (N=30)	Group-2 (N=30)	p-value
Preinduction	136.17±10.93	133.30±4.46	0.19 (NS)
T1	137.80±8.85	132.57±3.73	<0.01*
T2	140.33±8.55	120.97±4.85	<0.01*
T3	137.53±8.56	118.53±4.70	<0.01*
T4	134.47±8.81	117.03±3.52	<0.01*

N= number of patients.

Table 4: Diastolic blood pressure (mmHg)

	Group-1(N=30)	Group-2(N=30)	p-value
Preinduction	85.87±5.05	87.77±4.45	0.13 (NS)
T1	89.43±5.65	87.70±3.86	0.17 (NS)
T2	94.63±6.39	80.57±4.71	<0.01*
T3	90.97±6.46	76.60±3.86	<0.01*
T4	88.20±6.67	76.43±3.74	<0.01*

N= number of patients.

Table 5: Mean arterial pressure (mmHg)

	Group-1(N=30)	Group-2(N=30)	p-value
Preinduction	102.63±6.08	102.94±4.08	0.73 (NS)
T1	105.56±5.53	102.66±3.48	0.02*
T2	109.87±6.47	94.03±4.46	<0.01*
T3	106.49±6.55	90.58±3.95	<0.01*
T4	103.62±6.96	89.97±3.49	<0.01*

N= number of patients.

The two groups were compared as a patients characteristics in table I. HR, SAP, DAP, MAP were compared in both groups at preinduction level, T1, T2, T3, T4 level. Our study shows that HR were decreased at T2, T3, and T4 level in group II as compare to group I. SAP and MAP shows significant difference in both groups. It was reduced significantly in group II as compare to group I at T1 to T4 level. Our results shows that Dexmedetomidine 1 ug/kg is attenuates pressure response during endotracheal intubation as compared to 0.5 ug/kg of drug.

During our study not a single patients required inj. Atropine or inj. Ephedrine. There were no any side effects happened during study period.

Discussion

Airway management is a skill of an anesthesiologists. But laryngoscopy and intubation lead to physiological changes, specially increase in blood pressure by 40-50% and 20% increase in heart rate. But modern medicine dictum is “do not harm” any patient. So skillful airway management without changes in blood pressure and heart rate is required.

A wide variety of pharmacological agents were used for attenuation of pressure response like Fentanyl, Esmolol, Lignocaine, Alfentanyl, Remifentanil, Clonidine and many other drugs.[1] Dexmedetomidine is an alpha2 adrenergic receptor agonist, even 10 times more selective than clonidine. It is analgesic, has anesthetic sparing effect, sympatholytic propriety, useful in procedural sedation and also has cardiovascular stabilizing property. It reduces delirium and preserves respiratory function. [2,10]

Dexmedetomidine has been widely studied as an anesthetic sparing effects are well known. Vershali et al, studied Dexmedetomidine attenuate sympathoadrenal response to tracheal intubation and reduces perioperative anaesthetic requirement.in there study three patients were of craniotomies for supratentorial tumors. So induction as well as maintenance of anaesthesia is more importance to prevent cerebral ischemia. [3]

Sajith and coworkers studied the effects of 0.5 µg/kg dose of Dexmedetomidine for attenuation of stress response to endotracheal intubation in patients undergoing elective coronary off pump coronary artery bypass grafting. They concluded that use of Dexmedetomidine is a safe and effective method for reducing pressure response in a myocardial revascularization surgery even though patient was on beta blockers. [4]

Bon et al, studied Dexmedetomidine in a two different dose 0.5 µg/kg and 0.75µg/kg for attenuation of haemodynamic response to laryngoscopy and endotracheal intubation. They discussed that dose of 1 µg/kg Dexmedetomidine has been shown to cause increased sedation levels and need for oxygen supplementation. [5] But in our study we compare the doses of Dexmedetomidine in 0.5 µg/kg and 1 µg/kg for attenuation of pressure response. We found good results with 1 µg/kg Dexmedetomidine dose than 0.5 µg/kg dose.

Ashwini et al, compared Dexmedetomidine-Propofol versus Fentanyl-Propofol for insertion of laryngeal mask airway. They found decreased heart rate with Dexmedetomidine group as well as fentanyl group. [6] We found decreased heart rate with 1 µg/kg of Dexmedetomidine group.

Bright and coworkers studied feasibility of Dexmedetomidine as sole analgesic agent during robotic urological surgeries. They found that Dexmedetomidine provide good haemodynamic parameters and effective analgesic agent. [7]

Poonam et al, studied Dexmedetomidine as an anesthetic adjuvant in laparoscopic surgery: an observational study using entropy monitoring. Entropy is an innovative monitoring based on the acquisition and processing of raw EEG and facial electromyogram signals by using entropy algorithm. They observed that Dexmedetomidine is a good anesthetic adjuvant that decreases the requirement of anaesthetics and opioids, attenuates sympathoadrenal response, maintains the stable hemodynamics and provide an excellent recovery profile. [8]

Thapa et al, studied comparative study between Dexmedetomidine and Fentanyl for to obtund pressure response to laryngoscopy and intubation. They

observed that Dexmedetomidine tends to obtund adrenergic response to intubation better than Fentanyl. They were observed that at three minutes heart rate and blood pressure were above the baseline in both the groups and gradually decreased towards baseline in Fentanyl group and below the baseline in Dexmedetomidine. [9] In our study we found that heart rate and blood pressure reduced during intubation. The observation was statistically significant.

Many studies had been done for prevention of pressure response during intubation, laparoscopic surgery and for extubation of endotracheal tube. According to study done by Serpil Dogan and coworkers they found that Lidocaine and Esmolol equally effective to depressed stress response. [10]

One study had been done by Amar Kataria and coworkers that efficacy of Dexmedetomidine and Fentanyl on pressure response and pneumoperitoneum in laparoscopic cholecystectomy. They also found good results of Dexmedetomidine over Fentanyl group. [11]

A comparative study of efficacy of intravenous Dexmedetomidine and Esmolol for pressure attenuation of stress response during laryngoscopy and endotracheal intubation done by Hema B Gupta and Sagar Vyas. They found Dexmedetomidine 1µg/kg is more effective than Esmolol. [12]

Conclusion

Dexmedetomidine is a highly selective and potent α2 adrenoceptor agonist drug and attenuates pressure response during intubation significantly at 1ug/kg dose than 0.5ug/kg of dose.

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