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Comparison Of Dexmedetomide And Clonidine For Attenuation Of The Sympathoadrenal Response To Laryngoscopy And Endotracheal Intubation

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Abstract
Aims and objectives: This prospective, interventional, randomized and comparative study would be conducted to compare dexmedetomidine and clonidine for the attenuation of the sympathoadrenal response to laryngoscopy and endotracheal intubation.
Material and methods: The study would be conducted in total of 150 patients aged 18 – 60 years of either sex. The patients would be randomly assigned to either of the three groups, each having 50 patients, using block randomization. Then either of three pretreatment medications would be given as per group: GROUP 1 (Isotonic saline, IS): 20ml of isotonic saline infused over 10 mins. GROUP 2 (Dexmedetomidine, D): Dexmedetomidine 100mcg dissolved in 20 ml of isotonic saline, infused @1mcg/kg body weight over 10 mins. GROUP 3 (Clonidine group): Clonidine 100mcg dissolved in 20 ml of isotonic saline, infused @1mcg/kg body weight over 10 mins.
Results: The difference in SBP, DBP, MAP and HR between the groups was statistically not significant at 5 mins after drug infusion and highly significant at 10 mins after drug infusion, after induction with propofol, before intubation, and at 1, 3, 5 minutes after intubation and significant at 7 minutes after intubation.
Conclusion: We observed that dexmedetomidine was far superior to clonidine in the attenuation of the pressor response and furthermore, dexmedetomidine was also helpful in providing conscious sedation without any respiratory depression with very few side effects.

Keywords: dexmedetomidine, clonidine, conscious sedation, sympathoadrenal response,

1. Introduction

Endotracheal intubation is the trans-laryngeal placement of a tube into the trachea via the nose or mouth. Endotracheal intubation includes laryngoscopy and intubation. Direct Laryngoscopy and endotracheal intubation following induction of anaesthesia is associated with hemodynamic changes due to the reflex sympathetic discharge caused by epipharyngeal and laryngopharyngeal stimulation. This increased sympathoadrenal activity may result in hypertension, tachycardia and arrhythmias.
The magnitude of haemodynamic changes observed may be dependent on various factors such as premedication and anaesthetic agents used, depth of anaesthesia, whether any measure is taken prior to airway manipulation, the duration of laryngoscopy and intubation. The increase in blood pressure and heart rate are usually transient, variable and unpredictable. Transient hypertension and tachycardia are probably of no consequence in healthy individuals, but may be hazardous in patients with hypertension, myocardial insufficiency, cerebro-vascular diseases and intracranial hypertension. The augmented cardiovascular reflexes in the form of tachycardia and hypertension brought about by the noxious stimulus of laryngoscopy and intubation can prove to be detrimental for patients with cardiovascular and cerebrovascular diseases.[1]
Various pharmacological and non-pharmacological agents have been used to attenuate the hemodynamic response to laryngoscopy and endotracheal intubation.
Pharmacological methods like topical and intravenous lignocaine, narcotics, Beta-adrenergic blockers, calcium channel blockers and vasodilators have been tried. None of the above approaches or agents have proved to be

ideal. Hence, the search for an ideal agent to attenuate the hemodynamic responses is continuing.
Alpha-2 adrenergic agonists decreases sympathetic tone. Clonidine and dexmedetomidine have been shown to blunt the hemodynamic responses and have sedative and anaesthetic sparing effects.[2,3] Dexmedetomidine is a highly selective alpha-2 adrenergic agonist (full agonist) especially for the 2A subtype of this receptor, which causes it to be a much more effective sedative and analgesic agent. It has 8 times high affinity and alpha-2 selectivity as compared to clonidine (partial agonist) and has a shorter duration of action than clonidine. Alpha-2 to alpha-1 selectivity for dexmedetomidine is 1620:1 compared to 220:1 for clonidine. Dexmedetomidine has shown to decrease induction doses of intravenous anesthetics and to decrease intra-operative opioid and volatile anesthetic requirements for maintenance of anesthesia. In addition, it has shown to decrease perioperative catecholamine concentrations and promote perioperative hemodynamic and adrenergic stability. It provides anaesthetic sparing effects, anxiolysis, cooperative sedation and analgesia without respiratory depression.[4-6]
Dexmedetomidine has been recently introduced in India and not many studies have been done in India regarding its usefulness in suppressing intubation response. Therefore, this prospective, interventional, randomized and comparative study would be conducted to compare dexmedetomidine and clonidine for the attenuation of the sympathoadrenal response to laryngoscopy and endotracheal intubation.

2. Materials & Methods

A Prospective, interventional, randomized and comparative study was conducted at Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi
Inclusion criteria
- Patient age 18 - 60 years of either sex, of ASA grades I and II having BMI ≤ 30 kg/m2

Exclusion criteria
- Difficult airway (Mallampati grades 3 & 4)
- Pregnant & nursing women
- Patients who require emergency surgical interventions
- Patients with hemodynamic instability or having cardiac, hepatic, renal, endocrine, hypertensive disorders & on medications like beta-blockers, digitalis, anti-psychotics, anxiolytics, sedatives or patients allergic to study medications

Sample size determination
The reference study observed that the maximum rise of DBP was only 3.75% (83.05 ± 9.07) in the dexmedetomidine group and 19.23% (93.45 ± 7.09) in the clonidine group and 30.57% (100.8 ± 7.87) in the control group which was statistically significant. Also, during the laryngoscopy and intubation, a maximum rise of SBP was only 7.14% (135.3 ± 15.19) was observed from its baseline (126.45 ± 15.05) in the dexmedetomidine group as compared to the 14.67% (148.05 ± 10.01) increase in the clonidine group from its baseline (129.45 ± 11.02) and 25.56% (167.7 ± 15.97) increase in the control group from baseline (133.5 ± 17.38). Taking these values as reference, the minimum required sample size with 90% power of study and 5% level of significance is 38 patients in each study group. So total sample size taken is 150 (50 patients per group)[7]
Formula used is: -
For comparing mean of two groups
N>=2(standard deviation)2*(Zα+Zβ)2 /(mean difference)2
Where Zα is value of Z at two-sided alpha error of 5% and Zβ is value of Z at power of 90% and mean difference is difference in mean values of two groups.
The study would be conducted in total of 150 patients aged 18 – 60 years of either sex. The patients would be randomly assigned to either of the three groups, each having 50 patients, using block randomization. The study would be conducted by the use of a coded syringe for study medication. Patients will be allocated randomly to 3 groups as follows:
Then either of three pretreatment medications would be given as per group: GROUP 1 (Isotonic saline, IS): 20ml of isotonic saline infused over 10 mins.
GROUP 2 (Dexmedetomidine, D): Dexmedetomidine 100mcg dissolved in 20 ml of isotonic saline, infused @1mcg/kg body weight over 10 mins.
GROUP 3 (Clonidine group): Clonidine 100mcg dissolved in 20 ml of isotonic saline, infused @1mcg/kg body weight over 10 mins.
a. Dexmedetomidine preparation for infusion: - 1ml of dexmedetomidine = 100 mcg. 1ml of this solution will be added to 49ml of isotonic saline in a 50ml syringe, the resultant concentration being 100mcg/50ml or 2mcg/ml.
b. Clonidine preparation for infusion: - Inj. clonidine will be prepared as follows: 1ml of clonidine = 150 mcg. In a 5ml syringe 1ml of clonidine will be taken and diluted to 3ml in isotonic saline, each ml containing 50mcg. 2ml of this solution will be added to 48ml of isotonic saline in a 50ml syringe, the resultant concentration being 100mcg/50ml or 2mcg/ml.

The patients HR, Systolic, Diastolic and Mean arterial BP and SpO2 would be recorded just prior to study drug infusion (basal values) and at 5 minutes & 10 minutes following administration of study drugs. Ramsay Sedation Score (RSS) would be used to assess the level of sedation at 5- and 10-minutes during administration of study drug.

After 10mins of test drug infusion anaesthesia would be induced using inj. propofol 1% solution 2mg/kg body weight. After ensuring check ventilation with 100% O2, inj. vecuronium bromide 0.12 mg/kg body weight would be administered iv, then the patient would be ventilated with a mixture of N2O + O2 (1:1) with isoflurane 0.6 volume% using closed circuit ventilation. Normocapnic ventilation would be done. After 3 minutes of IPPV, endotracheal intubation would be performed. All intubations would be performed by the same anaesthesiology team and the laryngoscopy time noted. After checking for bilateral equal air entry, the endotracheal tube would be secured and fixed. The laryngoscopy time would be recorded (from the time of picking up the laryngoscope till confirmation of bilateral equal air entry).

The patient then shifted to the post-anaesthesia recovery unit (PACU). Any adverse events e.g tachycardia /bradycardia, hypotension / hypertension, other cardiac arrhythmias would be recorded. Bradycardia would be treated using inj.atropine 0.6 mg iv. Hypotension defined as a fall of 20% BP from baseline level of SBP and would be treated using rapid iv fluid infusion and vasopressors i.e inj. mephentermine 3mg i.v as and when required.

Observations and results

The age of patients in the present study ranged from 18 to 60 years. The mean age in clonidine group was 35.72 ± 10.48 years, dexmedetomidine group was 33.3 ± 9.98 years and in the saline group was 33.42 ± 9.19 years, respectively. The mean age was comparable between the three groups as p value is 0.389 (non-significant).

In clonidine group, total number of males were 30 (60.00%) and total no.of females were 20 (40.00%). In dexmedetomidine group, 21 (42.00%) patients were males and 29 (58.00%) patients were females. In saline group, 29 (58.00%) patients were males and 21 (42.00%) patients were females. The three groups were statistically comparable with regard to sex as p value is 0.142 (p> 0.05)

The three groups were statistically comparable with regard to BMI as p value is 0.135 (p > 0.05)

Table 1: Systolic BP at different time intervals

SBP (mm Hg)	Mean ± St dev			p value
	Clonidine	Dexmedetomidine	Saline	
Baseline	120.76 ± 10.89	123.52 ± 9.37	122.48 ± 9.05	0.366
TD5	117.92 ± 10.64	118.32 ± 11.64	122.52 ± 8.88	0.054
TD10	111.7 ± 11.07	110.26 ± 11.28	123.96 ± 9.09	<0.0001
Tpi	110.04 ± 10.79	106.38 ± 11.58	118.14 ± 9.01	<0.0001
Ti	111.24 ± 9.8	107.72 ± 12.18	119.52 ± 9.42	<0.0001
T1	133.02 ± 10.12	121.1 ± 7.99	137.86 ± 11.29	<0.0001
T3	126.1 ± 10.38	118.58 ± 8.3	130.16 ± 11.02	<0.0001
T5	118.28 ± 10.78	113.68 ± 9.67	125.14 ± 11.45	<0.0001
T7	118.34 ± 10.22	113.78 ± 9.06	119.5 ± 11.93	0.017

Table 1 shows the mean ± SD of the systolic BP within the different groups at various time intervals. The difference in SBP between the groups was statistically not significant at 5 mins after drug infusion and highly significant at 10 mins after drug infusion, after induction with propofol, before intubation, and at 1, 3, 5 minutes after intubation and significant at 7 minutes after intubation.

Table 2: Diastolic BP at different time intervals

DBP (mm Hg)	Mean ± St dev			p value
	Clonidine	Dexmedetomidine	Saline	
Baseline	75.74 ± 7.92	76.18 ± 7.31	74.72 ± 7.84	0.624
TD5	75.48 ± 8.04	74.78 ± 7.73	74.9 ± 7.83	0.893
TD10	74.88 ± 8.07	67.26 ± 6.75	78.22 ± 8.09	<0.0001
Tpi	74.1 ± 8.21	67.08 ± 6.56	76.44 ± 7.9	<0.0001
Ti	74.1 ± 8.21	66.6 ± 6.32	76.6 ± 7.92	<0.0001
T1	81.26 ± 8.35	76.18 ± 6.99	89.02 ± 7.24	<0.0001
T3	79.26 ± 8.35	72.92 ± 7.53	84.74 ± 7.68	<0.0001
T5	78.22 ± 8.41	71.84 ± 7.5	81.76 ± 7.89	<0.0001
T7	76.38 ± 8.26	72.98 ± 7.48	80.32 ± 7.76	<0.0001

Table 2 shows the mean ± SD of the diastolic BP of the different groups at various time intervals. The difference in diastolic BP between the groups was statistically not significant at 5 mins. after drug infusion and highly significant at 10 min. after drug infusion, after induction with propofol, before intubation, and at 1 , 3 , 5 and 7 minutes after intubation.

Table 3: Mean BP at different time intervals

MAP (mm Hg)	Mean ± St dev			p value
	Clonidine	Dexmedetomidine	Saline	
Baseline	90.74 ± 8.06	91.98 ± 6.44	90.64 ± 7.32	0.594
TD5	89.62 ± 7.97	89.24 ± 7.07	90.7 ± 7.29	0.598
TD10	87.12 ± 8.02	81.68 ± 6.67	93.42 ± 7.45	<0.0001
Tpi	86.06 ± 7.88	80.14 ± 6.68	90.36 ± 7.34	<0.0001
Ti	86.44 ± 7.61	80.34 ± 6.32	90.88 ± 7.47	<0.0001
T1	98.56 ± 8.05	91.16 ± 6.01	105.32 ± 6.13	<0.0001
T3	94.92 ± 7.93	88.18 ± 6.11	99.84 ± 6.45	<0.0001
T5	91.62 ± 7.73	85.74 ± 6.6	96.18 ± 6.66	<0.0001
T7	90.44 ± 7.55	86.6 ± 6.8	93.28 ± 6.49	<0.0001

Table 3 shows the mean ± SD of the mean BP of the different groups at various time intervals. The difference in mean BP between the groups was statistically not significant at 5 mins. after

drug infusion and highly significant at 10 min. after drug infusion, after induction with propofol, before intubation and at 1, 3, 5 and 7 minutes after intubation.

Table 4: Heart rate at different time intervals

HR (per min)	Mean ± St dev			p value
	Clonidine	Dexmedetomidine	Saline	
Baseline	87.74 ± 14.4	83.2 ± 13.12	85.7 ± 11.75	0.227
TD5	84.64 ± 14.4	73.7 ± 12.95	93.1 ± 12.35	<0.0001
TD10	82.52 ± 14.09	64.5 ± 11.41	99.58 ± 11.15	<0.0001
Tpi	83.7 ± 14.04	68.48 ± 12.65	95.56 ± 11.77	<0.0001
Ti	83.74 ± 14.4	67.2 ± 13.12	95.8 ± 11.79	<0.0001
T1	107.32 ± 14.23	83.52 ± 13.66	114.86 ± 11.27	<0.0001
T3	102.48 ± 14.15	82.84 ± 12.81	110.42 ± 11.28	<0.0001
T5	97.9 ± 14.43	82.68 ± 12.87	105.78 ± 11.56	<0.0001
T7	92.64 ± 14.31	82.84 ± 12.85	95.86 ± 11.49	<0.0001

Table 4 shows the mean ± SD of the heart rate of different groups at various time intervals. The difference was statistically highly significant at 5, 10 minutes after drug infusion, after induction with propofol, before intubation, and 1, 3, 5 and 7 minutes after intubation.
In spo2, the difference was statistically insignificant at 5, 10 minutes after giving the drug, before intubation and 1, 3 and 7 minutes after intubation. And stastistically significant after induction with propofol and 5 minutes after intubation, however thesevalues have no appreciable clinical significance.
In EtCO2, the difference was statistically insignificant at 5 minutes and 10 minutes after giving the drug, after induction with propofol, 1, 3, 5 and 7 minutes after intubation. And stastistically significant before intubation, however these values have no appreciable clinical significance.

Table 5: RSS at different time intervals

RSS	Mean ± St dev			p value
	Clonidine	Dexmedetomidine	Saline	
R5	2.18 ± 0.39	2.46 ± 0.5	1.94 ± 0.24	<0.0001
R10	2.18 ± 0.39	3.16 ± 0.37	1.82 ± 0.39	<0.0001

The difference in RSS between the groups was statistically highly significant at 5 and 10 minutes after drug infusion.

Discussion

The introduction of general anaesthesia made it possible to induce a state of controlled unconsciousness so that the patient is insensitive to pain and unaware of the events occurring during the surgical procedure. The anaesthetized patients are unable to maintain an adequate airway on their own, and there arises the need to employ artificial airway maintenance devices such as endotracheal tube. Traditionally, laryngoscopy and endotracheal intubation has been the mainstay in safeguarding the airway in such patients. Although intubation has its own advantages such as a safe and secured airway and prevention of aspiration and delivery of anaesthetic gases, it is not without complications. Laryngoscopy and endotracheal intubation are noxious stimuli capable of producing a huge spectrum of stress responses such as tachycardia, hypertension, laryngospasm, bronchospasm, raised intracranial pressure and intraocular pressure.[1]

The haemodynamic changes brought about by laryngoscopy and intubation were first described by Reid and Brace.[8] The haemodynamic response is initiated within seconds of direct laryngoscopy and further increases with the passage of the endotracheal tube. The response is initiated within 5 seconds of laryngoscopy, peaks in 1-2 min and returns to normal levels by 5 min.[9] These changes are usually short lived and well tolerated by normal patients. In patients with cardiovascular disease, it can incite harmful effects such as myocardial ischaemia, ventricular dysrrhythmias, ventricular failure and pulmonary oedema. It can also lead to cerebrovascular accidents in patients with cerebrovascular disease.[9] Various drug regimens and techniques such as lignocaine, opioids, nitroglycerine, calcium channel blockers (diltiazem) and β-blockers (esmolol) and alpha-2 receptor agonists (clonidine, dexmedetomidine) have been tried for obtunding the stress response.[10,11] α-2 receptor agonists mediate their action through α-2A receptors located in locus caeruleus, the predominant noradrenergic nuclei of upper brainstem. The presynaptic activation of α-2A receptors in the locus caeruleus inhibits the noradrenaline release and brings about sedation and hypnosis. Post-synaptic activation of α-2 receptors in central nervous system brings about decreased sympathetic activity leading to bradycardia and hypotension.[12] Dexmedetomidine is eight times more potent α-2 receptor agonist than clonidine. The action of dexmedetomidine is short lived with an elimination half-time of 2 hours. Dexmedetomidine has a reversal drug for its sedative effect called as atipamezole. Atipamezole acts by increasing the central turnover of noradrenaline. These factors make dexmedetomidine superior to clonidine[13] in obtunding the sympathoadrenal response to laryngoscopy and endotracheal intubation.[14]

With this background, we decided to conduct a study to evaluate the efficacy of intravenous dexmedetomidine (1mcg/kg) and clonidine (1mcg/kg) for attenuation of the sympathoadrenal responses to laryngoscopy and endotracheal intubation, in patients undergoing elective surgical procedures under general anaesthesia.

Ozair et al (2018)[15] studied comparative evaluation of dexmedetomidine and fentanyl to attenuate hemodynamic response to laryngoscopy and intubation. 60 patients were randomly divided into two groups of 30 patients each (in present study, 3 groups of 50 patients each, with sample size 150 were taken). This study also concluded that dexmedetomidine in dose of 1 mcg/kg blunted the hemodynamic response to laryngoscopy and intubation to a greater magnitude than fentanyl in a dose of 2 mcg/kg intravenously as a premedicant. The findings of this study are similar to the present study as we also observed that inj. dexmedetomidine 1 mcg/kg was much better in attenuating the haemodynamic pressor response to laryngoscopy and endotracheal intubation.

Sebastian et al (2017)[16] compared two doses of intravenous dexmedetomidine in attenuation of haemodynamic responses to laryngoscopy and endotracheal intubation. 90 patients of ASA Physical Status I (we recruited both ASA I and II patients with total of 150 patients divided into three groups) were enrolled in the study and divided into three equal groups. Group A received normal saline, Group B received inj. dexmedetomidine 0.5 mcg/kg and Group C received inj. dexmedetomidine 0.75 mcg/kg as an infusion over 10 min. This study also concluded that dexmedetomidine in a dose of 0.75 mcg/kg iv was the optimal dose for attenuation of the stress response to laryngoscopy and endotracheal intubation. In our study, we used a higher dose of dexmedetomidine (1 mcg/kg) which proved to be better than clonidine (1 mcg/kg).

Marulasiddappa et al (2017)[17] compared clonidine and lignocaine for attenuating the pressor responses to laryngoscopy and endotracheal intubation in neurosurgical cases (we use clonidine and dexmedetomidine, in elective surgeries which also include neurosurgical cases). 60 patients were randomly allocated into one of the two groups: Group L (n = 30) received lignocaine 1.5 mg/kg intravenous (iv) before induction and Group C (n = 30) received clonidine 2 mcg/kg i.v. before induction (in our study, 3 groups of 50 patients each, with sample size 150 were taken). This study concluded that clonidine was more effective than lignocaine for attenuating the pressor responses to laryngoscopy and endotracheal intubation in neurosurgical cases. In our study, we concluded that dexmedetomidine was better than clonidine in attenuation of the pressor response to laryngoscopy and endotracheal intubation in neurosurgical cases.

Patel et al (2015)[18] compared intravenous dexmedetomidine with intravenous fentanyl for suppression of hemodynamic responses to laryngoscopy and endotracheal intubation during general anesthesia. 60 patients were randomly allocated into two groups. In Group D cases (n=30) received injection dexmedetomidine 1 mcg/kg, Group F cases (n=30) received fentanyl 2 mcg/kg. This study also concluded that dexmedetomidine in dose 1 mcg/kg iv was more effective in attenuating the hemodynamic pressor responses to laryngoscopy and

endotracheal intubation than Inj. fentanyl 2 mcg/kg iv. The findings of this study are similar to the present study as we also observed that inj. dexmedetomidine 1 mcg/kg was much better in attenuating the haemodynamic pressor response to laryngoscopy and endotracheal intubation.

Gulabani et al (2015)[19] studied efficacy of lignocaine 1.5 mg/kg and two different doses of dexmedetomidine (0.5 mcg/kg and 1 mcg/kg) in attenuating the hemodynamic pressor response to laryngoscopy and intubation. In this study, 90 adults aged 18-65 years of age of either sex of non-hypertensive ASA Grade I or II were randomly allocated into three groups. Group D1- iv dexmedetomidine 0.5 mcg/kg over 10 minutes, Group D2- iv dexmedetomidine 1 mcg/kg over 10 minutes, Group X- iv lignocaine 1.5mg/kg in 10 ml normal saline. This study concluded that dexmedetomidine 1 mcg/kg adequately attenuated the hemodynamic response to laryngoscopy and endotracheal intubation when compared with dexmedetomidine 0.5 mcg/kg and lignocaine 1.5 mg/kg. The findings of this study are similar to the present study as we also observed that inj. dexmedetomidine 1 mcg/kg was much better in attenuating the haemodynamic pressor response to laryngoscopy and endotracheal intubation.

Prasad et al (2015)[20] studied comparison of intravenous lignocaine and intravenous dexmedetomidine for attenuation of hemodynamic stress response to laryngoscopy and endotracheal intubation. A total of 100 ASA physical status I and II patients posted for elective surgery under general anesthesia were enrolled in the study. Patients were randomly divided into two groups, group L (lignocaine group) and group D (dexmedetomidine group) with 50 patients in each group. Group L received 1.5 mg/kg of lignocaine iv and group D received 1 mcg/kg of dexmedetomidine as iv infusion. Thiopentone was given until the eyelash reflex disappeared and intubation was facilitated with succinylcholine (in our study, we used propofol and vecuronium). Anesthesia was maintained with 33:66 (oxygen:Nitrous oxide), isoflurane, and vecuronium (we used 50:50 oxygen:nitrous oxide, isoflurane 0.6%). This study also concluded that dexmedetomidine attenuated the hemodynamic stress response to laryngoscopy and intubation more effectively compared with lignocaine without any deleterious effects. Furthermore, dexmedetomidine decreases the dose of thiopentone for induction of anesthesia. The findings of this study are similar to the present study as we also observed that inj. dexmedetomidine 1 mcg/kg was much better in attenuating the haemodynamic pressor response to laryngoscopy and endotracheal intubation.

None of the patients exhibited any adverse effects such as hypotension, bradycardia, respiratory depression and fall in oxygen saturation.

The hemodynamic response to laryngoscopy and endotracheal intubation has been a topic of discussion since 1940, when Reid and Brace[21] found that the stimulation of the upper respiratory tract provoked an increase in the vagal activity. A year later, Burstein et al totally contradicting Reid's statement, found that the pressor response was due to an augmented sympathetic activity, which was provoked by the stimulation of the epipharynx and the laryngopharynx, which was further confirmed by Prys-Roberts.[22]

Scheinin et al.[23] also observed that dexmedetomidine attenuated the cardiovascular responses to laryngoscopy and tracheal intubation. In their study, they measured catecholamine concentration and found that the concentration of noradrenaline in mixed venous plasma was smaller in the dexmedetomidine group during all phases of induction. The hemodynamic effects of dexmedetomidine probably resulted result from peripheral and central mechanism. α2-Adrenoreceptor agonists show a biphasic, dose-dependent, blood pressure effect. At low doses, the dominant action of α2-adrenoreceptor agonist activation is a reduction in sympathetic tone, mediated by a reduction of norepinephrine release at the neuroeffector junction, and an inhibition of neurotransmission in sympathetic nerves.[10] The net effect of dexmedetomidine action is a significant reduction in circulating catecholamines with a slight decrease in blood pressure and a modest reduction in HR.[24]

Many other authors have used single dose dexmedetomidine prior to induction and have achieved suppression of hemodynamic responses during laryngoscopy and intubation and also have noticed the reduction of anesthetic requirement.[23,14] Stress response to extubation is equally suppressed by dexmedetomidine given prior to reversal.[17,18]

3. Conclusions

Dexmedetomidine significantly attenuated the sympathetic response to laryngoscopy and intubation. Clonidine also reduced the pressor response, but it was not as effcious as dexmedetomidine in attenuating the response to laryngoscopy and intubation. We observed that dexmedetomidine was far superior to clonidine in the attenuation of the pressor response and furthurmore, dexmedetomidine was also helpful in providing conscious sedation without any respiratory depression with very few side effects. An intravenous dose of dexmedetomidine 1 mcg/kg administered before laryngoscopy and endotracheal intubation can be recommended to attenuate the sympathoadrenal response to the laryngoscopy and intubation without any appreciable side-effects.

4. References

1. Shribman AJ, Smith G, Achola KJ. Cardiovascular and catecholamine responses to laryngoscopy with and without tracheal intubation. Br J Anaesth 1987;59:295-9
2. Sun HL, Wu TJ, Ng CC, Chien CC, Huong CC, Chie WC, et al. Efficacy of oropharyngeal lidocaine instillation on hemodynamic responses to orotracheal intubation. J Clin Anaesth 2009;21:103-7.
3. Mikawa k, Nishina k, Meckawa N, Obara H. Comparison of nicardipine, diltiazem and verapamil for controlling the cardiovascular responses to tracheal intubation. Br J Anaesth 1996;76:221-6.
4. Virtanen R, Scanda JM, Saano V, Nymen L. Characterization of the selectivity, specificity and potency of medetomidine as an alpha 2 adrenoceptor agonist. Eur J Pharmacol 1988;150:9-14
5. Scheinin H, Virtenen R, MacDonald E, Lammintausta R, Scheinin M. Medetomidine novel alpha—2 adrenoceptor agonist: a review of its pharmacodynamic effects. Prog Neuropsychopharmacol Biol Psy 1989;13:635-51.
6. Bloor BC, Ward DS, Belleville JP, Maze M. Effects of intravenous dexmedetomidine in humans. Anesthesiology 1992;77:1134–42
7. Mondal S, Mondal H, Sarkar R, Rahaman M. Comparison of dexmedetomidine and clonidine for attenuation of sympathoadrenal responses and anesthetic requirements to laryngoscopy and endotracheal intubation. Int J Basic Clin Pharmacol 2014;3:501-6
8. Reid LC, Brace DE. Irritation of the respiratory tract and its reflex effect upon heart. Surg Gyn Obs 1940;70:157-62
9. Henderson J. Airway management in the adult. In: Miller RD (Ed.). Miller's Anaesthesia. 7th ed. Philadelphia: Churchill Livingstone; 2010. p. 1573-610
10. Adachi YU, Satomoto M, Higuchi H, Watanabe K. Fentanyl attenuates the hemodynamic response to endotracheal intubation more than the response to laryngoscopy. Anesth Analg 2002;95:233-7
11. Rathore A, Gupta GK, Tanwar GL, Rehman H. Attenuation of the pressure response to laryngoscopy and endotracheal intubation with different doses of esmolol. Indian J Anaesth 2002;46:449-52
12. Paranjpe JS. Dexmedetomidine: Expanding role in anesthesia. Med J DY Patil Univ 2013;6:5-13
13. Yazbek-Karam VG, Aouad MM. Perioperative uses of dexmedetomidine. Middle East J Anaesthesiol 2006;18:1043-58
14. Karhuvaara S, Kallio A, Salonen M, Tuominen J, Scheinin M. Rapid reversal of alpha 2-adrenoceptor agonist effects by atipamezole in human volunteers. Br J Clin Pharmacol 1991;31:160-5
15. Ozair E, Ali QE, Siddiqi MMH, Amir SH, Naaz S. A comparative evaluation of dexmedetomidine and fentanyl to attenuate hemodynamic response to laryngoscopy and intubation. Asian J of Med Sci 2018;9:65-72
16. Sebastian B, Talikoti AT, Krishnamurthy D. Attenuation of haemodynamic responses to laryngoscopy and endotracheal intubation with intravenous dexmedetomidine: A comparison between two doses. Indian J Anaesth 2017;61:48-54
17. Marulasiddappa V, Nethra HN. A comparative study of clonidine and lignocaine for attenuating pressor responses to laryngoscopy and endotracheal intubation in neurosurgical cases. Anesth Essays Res 2017;11:401-5
18. Patel ND, Patel JJ, Patel DD. A study on comparison of intravenous dexmedetomidine with intravenous fentanyl for suppression of hemodynamic responses to laryngoscopy and endotracheal intubation during general anesthesia. Nat J Med Res 2015;5:127-31
19. Gulabani M, Gurha P, Dass P, Kulshreshtha N. Comparative analysis of efficacy of lignocaine 1.5 mg/kg and two different doses of dexmedetomidine (0.5 μg/kg and 1 μg/kg) in attenuating the hemodynamic pressure response to laryngoscopy and intubation. Anesth Essays Res 2015;9:5-14.
20. Prasad SR, Matam UM, Ojili GP. Comparison of intravenous lignocaine and intravenous dexmedetomidine for attenuation of hemodynamic stress response to laryngoscopy and endotracheal intubation. J NTR Univ Health Sci 2015;4:86-90
21. Reid LC, Brace DE. Irritation of the respiratory tract and its reflex effect upon heart. Surg Gyn Obs 1940;70:157-62
22. Prys– Roberts C, Greene LT, Meloche R, Foex P. Studies of anaesthesia in relation to hypertension. ii. Hemodynamic consequences of induction and endotracheal intubation. Br J Anaesth 1971;43:531-47
23. Scheinin B, Lindgren L, Randell T, Scheinin H, Scheinin M. Dexmedetomidine attenuates sympathoadrenal responses to tracheal intubation and reduces the need for thiopentone and peroperative fentanyl. Br J Anaesth 1992;68:126-31.
24. Khan ZP, Ferguson CN, Jones RM. Alpha-2 and imidazoline receptor agonists. Their pharmacology and therapeutic role. Anaesthesia 1999;54:146-65.