ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

THE EFFECT OF INTRAVENOUS DEXMEDETOMIDINE TO ATTENUATE CARDIOVASCULAR & AIRWAY RESPONSES TO TRACHEAL EXTUBATION

Dr. Swati Sharma, Dr. Hemani Ahuja, Dr. Melchisedec Singh

(Junior Resident)

(Associate Professor)

(professor)

[1,2,3]Department of Anaesthesia, CMC Ludhiana , Punjub, India

Corresponding Author: Dr.Hemani Ahuja

Background: Tracheal extubation significantly alters hemodynamic responses and produces unwanted airway reflexes. The objective of our study was to assess the effectiveness of Dexmedetomidine, an alpha 2 adrenergic agonist, in attenuating these responses and to observe its adverse effects.

Material & Methods: This prospective, randomized double blind study was conducted on 60 patients undergoing surgeries in general anaesthesia. Group D received I.V. infusion of Dexmedetomidine 0.5 µg per kg body weight in 100ml of normal saline 10 min before discontinuation of inhalation agent at the end of surgery and Group N received I.V. infusion of Normal Saline 100ml (Placebo).Heart rate, mean arterial pressure, systolic blood pressure, diastolic blood pressure, time taken for extubation ,quality of extubation, and adverse effect was measured from the time of administration to 30 min after extubation.

Results: In Group D 23.33% of patient had hypotension where as in Group N the incidence of hypotension was 10%. In Group D 6.67% of patient had emergence delirium compared to 56.67%in Group N. The incidence od bradycardia in Group D 16.67% in comparison to 6.67% in Group N. Significantly higher sedation score was observed in Group D. Quality of extubation was better in Group D.

Conclusion: Intravenous dexmedetomidine 0.5 mcg/kg before

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

extubation significantly attenuates the hemodynamic and airway responses to extubation without significant prolongation of extubation time and with minimal side effects, that can be easily managed.

Keywords: Dexmedetomidine, bradycardia, tracheal extubation,

Introduction

cardiovascular responses and airway responses

Airway management is recognised as a crucial component of surgical care management.[1]

Tracheal extubation is performed at the end of surgical procedure when patient is fully awake and is able to protect his/her airway. For a smooth extubation, there should be no straining, movement, coughing, breath holding or laryngospasm. Extubation at light levels of anaesthesia or sedation can stimulate reflex responses via tracheal and laryngeal irritation.[2-4] The patient's airway may be less accessible at the end anaesthesia because of positioning for surgery, and there are additional stressors such as extraneous noise and fatigue.[5-7]

Dexmedetomidine, an α2-adrenoreceptor agonist with a distribution half-life of approximately 6 minutes has been successfully used for attenuating the stress response. Dexmedetomidine attenuates hemodynamic stress response to extubation by sympatholysis. It minimizes the discomfort of patients with spontaneous respiration. Although the risk of bradycardia and hypotension should be considered, those events can be easily managed with atropine and vasoactive agents.[8-9]

In addition to this there is increase evidence of its organ protective effect against ischemic and hypoxic injury, including cardioprotective, neuroprotective and reno-protective.[10]

The objective of the study is to assess the effectiveness of dexmedetomidine to attenuate the cardiovascular and airway responses to tracheal extubation and to observe its adverse effects.

Patients and Methods

This was a double blinded prospective randomized comparative study conducted on on 60 patient undergoing surgery lasting for more than two hours

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

under general anaesthesia. The patients were randomly divided into two groups of 30 each using sealed envelope technique. The anaesthetist, who was blinded to the purpose of study, prepared the study drug.

Group D received I.V infusion of dexmedetomidine 0.5µg/kg body weight in 100ml of normal saline over 10 min. Group N received I.V infusion of 100ml normal saline(placebo)

INCLUSION CRITERIA

Age between 18 yr and 65yr.

Patient with ASA class 1 and 2

Patient undergoing surgery under general anaesthesia.

EXCLUSION CRITERIA

Patient with hypersensitivity to study drug.

Patient on beta-blockers or on antidepressant drug.

Patient with history of hepatic and renal disease.

Patient with history of AV block, bradycardia, sick sinus syndrome

Patient with history of nausea and vomiting.

Pre-operative heart rate (HR), SBP,DBP,MAP, Oxygen saturation was noted. A standard general anaesthesia was given, comprising propofol(1.5-2.5mg/kg), fentanyl(1-2ug/kg), vecuronium(0.08-0.1mg/kg). Anesthesia was maintained by isoflurane0.8%-1.2%in N2O 60% and O2 40%..About 10 minutes before discontinuation of inhalation agent,at the end of surgery each patient received specific test solution as an I.V infusion over 20 min. HR,SBP,DBP,MAP, and SPO_2 was recorded just before administration of test solution and thereafter at 1,3,5,10 and 15 minutes. Residual neuromuscular blockade was reversed by Neostigmine 50µg/kg and Glycopyrrolate 10µg/kg, once the patient starts spontaneous breaths. When the spontaneous respiration was adequate and patient was able to follow simple commands, suction of throat was done and tracheal extubation was performed. The parameters were recorded one minute before extubation ,during extubation, and at 1,3,5,10,15,20&30 minutes after extubation. Time to extubation was recorded. The occurrence of coughing or gagging,

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

breath holding, laryngospasm, bronchospasm, emergence delirium and undue sedation was also be recorded. Hypotension was corrected by I.V fluids and injection mephentermine 3mg I.V if required. Bradycardia was corrected, if associated with hemodynamic instability with atropine 0.6mg I.V. Quality of extubation was evaluated based on cough immediately after extubation; using 5 points[11].

Sedation level was accessed by Ramsay Sedation Score.[12]

STATISTICAL ANALYSIS

The data was entered into Microsoft excel sheet. Data was summarized using frequency distribution and descriptive analysis. Chi square test was used to find out the association of categorical variables. Mann Whitney U test was used to compare the continuous variables into two groups. ANOVA for repeated measures was used to compute the difference in outcome in different interval of time. Post-hoc analysis was done using Bonferroni correction to find the changes in cardiovascular hemodynamics parameters from baseline to different interval of time. The P value <0.05 was considered significant. All statistical analysis was performed using SPSS version 26.0.

Result

Coughing and other airway events

Among the patients of group D, 50 percent of the patients had smooth extubation with minimal coughing, 26.67 percent of the patients had no coughing while only 3.33 percent of the patients had poor extubation. Among the patients of group N, 40 percent of the patients had smooth extubation with minimal coughing, 10 percent of the patients had no coughing while 26.67 percent of the patients had poor extubation.

Quality of extubation	**Group D**		**Group N**		**p-value**
	Number	**Percentage**	**Number**	**Percentage**	
No coughing	8	26.67	3	10	0.008*
Smooth extubation, minimal coughing (1-2 times)	15	50	12	40	

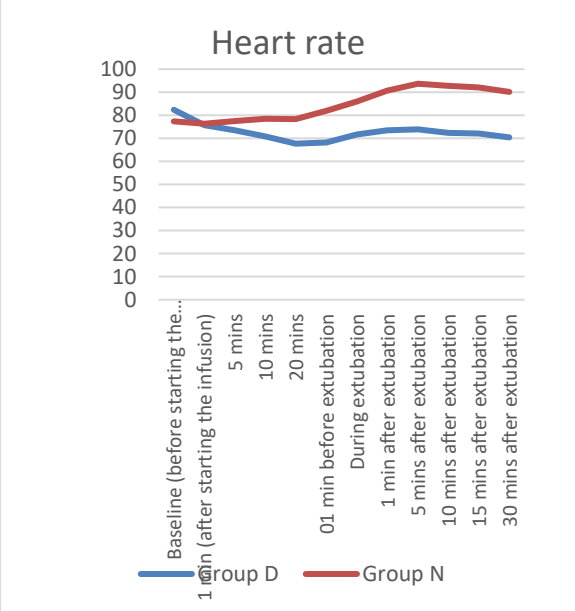
ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

Moderate coughing (3-4 times)	6	20	4	13.33	
Severe coughing (5-10 times)	0	0	8	3.33	
Poor extubation (laryngospasm/coughing >10 times)	1	3.33	3	26.67	

*: Significant

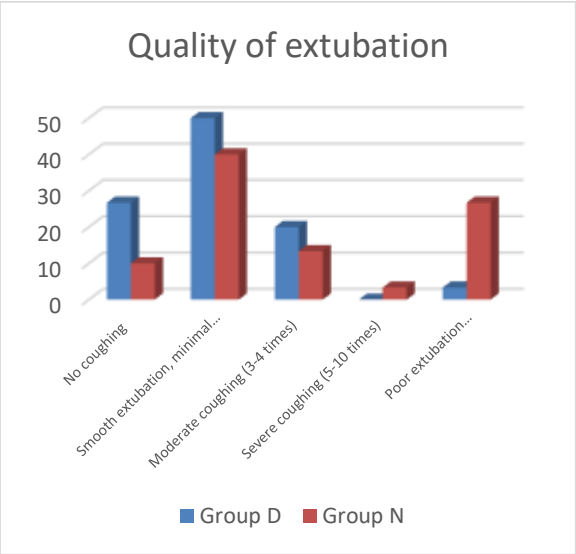
Hemodynamic results

The mean heart rate was compared between the two groups at various time interval and was found to be statistically higher in Group N at 10 min before extubation to 30 min after extubation, compared to Group D.



ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

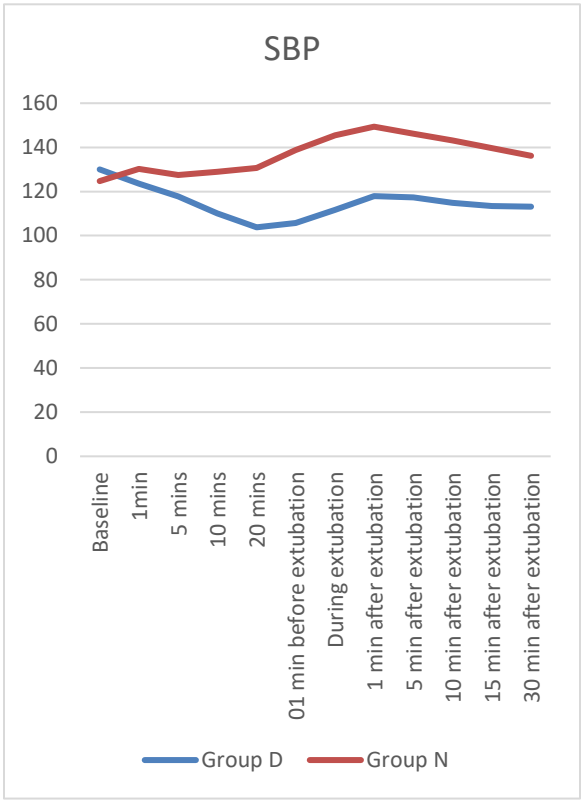
Heart rate	Group D		Group N		p-value
	Mean	SD	Mean	SD	
Baseline (before starting the infusion)	82.37	14.16	77.33	11.12	0.131
1 min (after starting the infusion)	75.70	12.42	76.33	9.51	0.825
5 mins	73.47	12.39	77.53	9.73	0.163
10 mins	70.83	12.05	78.53	10.15	0.010*
20 mins	67.67	12.96	78.27	11.06	0.001*
01 min before extubation	68.23	13.52	81.93	11.71	0.001*
During extubation	71.67	14.05	86.00	14.04	0.001*
1 min after extubation	73.50	13.49	90.73	15.49	0.001*
5 mins after extubation	73.90	12.41	93.67	13.99	0.001*
10 mins after extubation	72.33	12.13	92.70	13.35	0.001*
15 mins after extubation	72.03	11.04	92.00	11.58	0.001*
30 mins after extubation	70.43	9.59	90.17	11.74	0.001*



ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

MAP	Group D		Group N		p-value
	Mean	SD	Mean	SD	
Baseline	68.37	6.88	68.10	5.04	0.865
1min	65.43	5.81	68.77	6.08	0.034
5 mins	64.10	5.05	68.97	6.34	0.002*
10 mins	62.27	4.53	70.33	5.29	0.001*
20 mins	62.27	4.93	69.57	5.96	0.001*
1 min before extubation	62.47	5.46	70.90	5.27	0.001*
During extubation	62.97	6.26	73.23	6.62	0.001*
1 min after extubation	63.87	6.13	75.63	6.68	0.001*
5 min after extubation	64.17	6.84	75.77	7.64	0.001*
10 min after extubation	63.57	5.97	75.77	8.82	0.001*
15 min after extubation	63.63	5.31	73.63	11.38	0.001*
30 min after extubation	64.20	8.25	73.87	7.43	0.001*

The blood pressure when compared between the two groups, was significantly higher in Group N compared to Group D at all the time intervals.



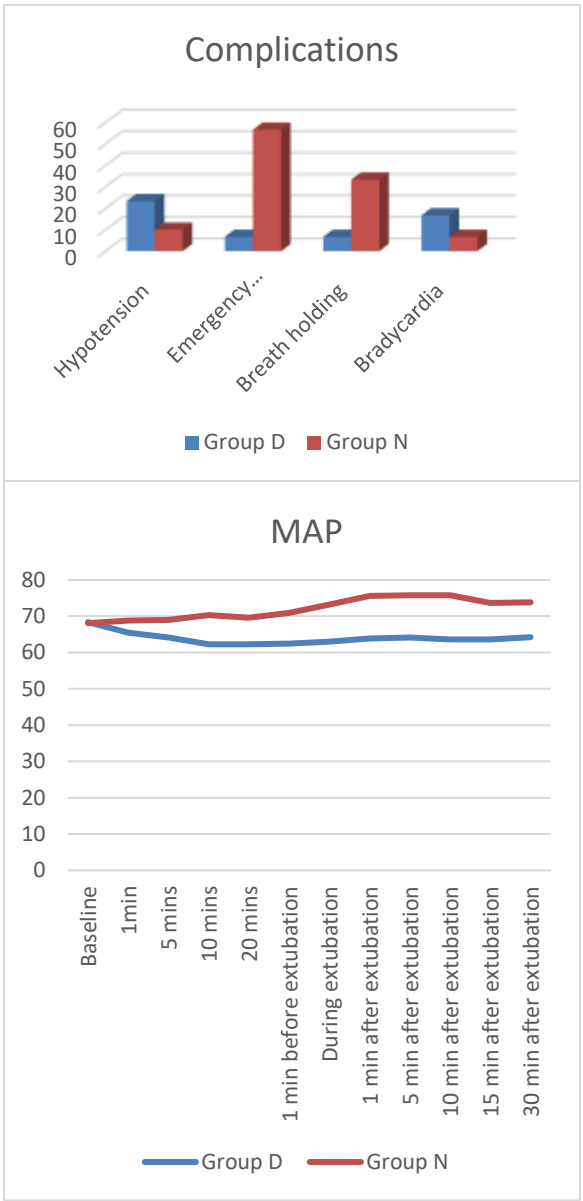
The mean arterial pressure when compared between the two groups, was statistically higher in Group N compared to Group D except at baseline and 5min.

Discussion

Tracheal extubation is not only an important milestone for patient recovery, but also a procedure that carries a considerable risk of complication or failure. Analysis of the American Society of Anaesthesiologists (ASA) Closed Claims database has demonstrated that

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

although outcomes related to airway complications at the time of intubation have been improving over the last 20 years, the same does not hold true for extubation.[2]



Smooth extubation requires the absence of straining, movement, coughing, breath holding or laryngospasm. Further, it is particularly important to avoid increases in heart rate and blood pressure in intraocular-, neuro-, and vascular surgery. Many techniques and drugs have been proposed for the attenuation of cardiovascular and airway responses, but none have been completely successful.

This study concludes that intravenous dexmedetomidine 0.5mcg/kg before extubation significantly attenuates the hemodynamic and airway responses to extubation with minimal prolongation of extubation time and with side effect like bradycardia and hypotension that can be easily managed. It provides adequate sedation while maintaining patient arousability.

References

1. Li LT, Chitilian HV, Alfille PH, Bao X. Airway management and anesthesia for airway surgery: a narrative review. Transl Lung Cancer Res. 2021 Dec;10(12):4631-4642.

2. Minogue SC, Ralph J, Lampa MJ. Laryngotracheal topicalization with lidocaine before intubation decreases the incidence of coughing on emergence from general

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 08, 2023

anesthesia. Anesth Analg. 2004 Oct;99(4):1253-7.

3. Aouad MT, Al-Alami AA, Nasr VG, Souki FG, Zbeidy RA, Siddik-Sayyid SM. The effect of low-dose remifentanil on responses to the endotracheal tube during emergence from general anesthesia. Anesth Analg. 2009 Apr;108(4):1157-60.

4. Aantaa R, Kanto J, Scheinin M, Kallio A, Scheinin H. Dexmedetomidine, an alpha 2-adrenoceptor agonist, reduces anesthetic requirements for patients undergoing minor gynecologic surgery. Anesthesiology. 1990 Aug;73(2):230-5.

5. Ogilvie L. Difficult Airway Society guidelines for the management of tracheal extubation. Anaesthesia. 2012 Nov;67(11):1277-8

6. Miller KA, Harkin CP, Bailey PL. Postoperative tracheal extubation. Anesth Analg. 1995;80:149-2

7. Wong TH, Weber G, Abramowicz AE. Smooth extubation and smooth emergence techniques: a narrative review. Anesthesiol Res Pract. 2021;8883257

8. Kaur M, Singh PM. Current role of dexmedetomidine in clinical anesthesia and intensive care. Anesth Essays Res. 2011 Jul-Dec;5(2):128-33.

9. Gertler R, Brown HC, Mitchell DH, Silvius EN. Dexmedetomidine: a novel sedative-analgesic agent. Proc (Bayl Univ Med Cent). 2001 Jan;14(1):13-21.

10. Hofer RE, Sprung J, Sarr MG, Wedel DJ. Anesthesia for a patient with morbid obesity using dexmedetomidine without narcotics. Can J Anaesth. 2005 Feb;52(2):176-80

11. Turan G, Ozgultekin A, Turan C, Dincer E, Yuksel G. Advantageous effects of dexmedetomidine on haemodynamic and recovery responses during extubation for intracranial surgery. Eur J Anaesthesiol. 2008 Oct;25(10):816-20.

12. Ramsay MA, Huddleston P, Hamman B, Tai S, Matter G. The patient state index correlates well with the Ramsay sedation score in ICU
patients. Anesth 2004;101:A338.