ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 17, Issue 1, 2024

Online - 2455-3891
Print - 0974-2441

Research Article

EFFECTS OF INTRAVENOUS LIDOCAINE VERSUS DEXMEDETOMIDINE ON ATTENUATION OF COUGH DURING TRACHEAL EXTUBATION AFTER ELECTIVE SURGERY: A COMPARATIVE DOUBLE-BLIND STUDY

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Received: 08 November 2023, Revised and Accepted: 20 December 2023

ABSTRACT

Objective: The objective of the study is to compare the effects of intravenous lidocaine and dexmedetomidine in attenuating cough during tracheal extubation after elective surgery.

Methods: Study conducted on 100 patients aged 18–65 years at Mahatma Gandhi University of Medical Sciences and Technology from August 2020 to July 2021. Patients with elective surgeries under general anesthesia with endotracheal intubation, age 18–65 years, both the sexes, American Society of Anesthesiologists, grade I and II were included in the study.

Results: Both lidocaine and dexmedetomidine are equally effective in cough attenuation on tracheal extubation. The hemodynamic stability was much better with dexmedetomidine compared to lidocaine at all times. Lidocaine group patients were ready to discharge from post-anesthesia care unit statistically earlier than the dexmedetomidine group.

Conclusion: Both lidocaine and dexmedetomidine are safe and reliable drugs which provide very effective attenuation of cough during tracheal extubation without any respiratory depressant effect.

Keywords: Cough, Lidocaine, Dexmedetomidine, Tracheal extubation.

 DOI: http://dx.doi.org/10.22159/ajpcr.2024v17i1.50228. Journal homepage: https://innovareacademics.in/journals/index.php/ajpcr

INTRODUCTION

It has generally been observed that approximately 82.5% of patients experience cough during emergence from general anesthesia, probably because of the presence of endotracheal tube, uncleared secretions, and anesthetic gases. Endotracheal extubation refers to the removal of endotracheal tube from the trachea. Although cough is a protective reflex and occurs due to airway irritation at the time of extubation, cough during tracheal extubation may lead to several complications [1].

To minimize the possibility of complications related to extubation, the plan should be a smooth extubation without compromising the hemodynamic stability of the patient as well as with minimal emergence of cough. During tracheal extubation, coughing occurs which causes aerosol generation [2]. Extubation necessitates proximity of an anesthetist and other health-care workers to the patient. A smooth extubation without straining or coughing helps in preventing the unnecessary exposure of operating room personnel to aerosolized, maybe potentially infectious airway secretions. It also prevents other complications associated with coughing during extubation, so our aim should be smooth tracheal extubation without coughing and bucking on the endotracheal tube.

Various drug regimens and techniques have been used from time to time to attenuate these responses during extubation such as the use of laryngeal mask airway during emergence, extubation in deep plane of anesthesia, use of drugs such as intravenous dexmedetomidine, intravenous lignocaine, and short-acting opioids such as intravenous fentanyl, remifentanil, and esmolol in the past [3]. Dexmedetomidine is a new alpha-2 agonist that decreases circulating catecholamines with a slight decrease in blood pressure and modest reduction in heart rate (HR) [4].

Lidocaine on the other hand suppresses the cough reflex due to tracheal extubation by its effect on synaptic transmission and attenuates the hemodynamic response by its peripheral vasodilatory effect, direct myocardial depressant effect, and central stimulant effect [4]. After reviewing through the available literature, we could not find any reliable method or technique for smooth, cough-free extubation. Hence, we planned this double-blind study to compare the effects of intravenous lidocaine and dexmedetomidine on attenuation of cough during tracheal extubation after elective surgery. The current study has been intended to compare the effects of intravenous lidocaine and dexmedetomidine in attenuating cough during tracheal extubation after elective surgery.

METHODS

This was a prospective, randomized, comparative, double-blind study conducted on 100 patients aged 18–65 years at Mahatma Gandhi University of Medical Sciences and Technology from August 2020 to July 2021. Patients with elective surgeries under general anesthesia with endotracheal intubation, age 18–65 years, both the sexes, American Society of Anesthesiologists, grade I and II were included in the study. Patients not giving consent, patients with active upper respiratory tract infection, patients with chronic cough, a current smoking status, patients scheduled for airway surgery, patients with bradycardia or an atrioventricular condition block, hepatic insufficiency, renal insufficiency, patients belonging to the American Society of Anesthesiologists III and above, patients with history of allergy to drugs under study, and patients with psychiatric disorders were ruled out from the study. Patients were randomized into two groups of 50 each into Group A and Group B after obtaining approval from the ethical committee of the institute. On the day of surgery, nothing per oral status was confirmed. Investigations were reviewed.

After extubation, patients were given 100% oxygen by bag and mask and then oxygenation was switched over to face mask at 5L/min. Patients were shifted to post-anesthesia care unit (PACU) and vitals were monitored and recorded a long with time taken to achieve modified Aldrete score 9 or above and sedation score at the time of shift to the ward.

RESULTS

The mean age in Group A was 43.83±15.31 years while in Group B was 45.40±13.45 years. The mean BMI in Group A was 24.17±3.54 kg/m^2, whereas in Group B was 25.03±3.09. Patients were randomly allocated in two study groups irrespective of the gender. Group A had 21 females and 29 males, whereas Group B had 32 females and 18 males (Table 1).

The mean baseline HR in Group A was 79.10±13.50, whereas in Group B was 81.90±7.89, which was comparable (p=0.209) (Fig. 1).

Significant difference was observed in HR just before and after extubation and in PACU, proving dexmedetomidine to be better in maintaining HR compared to lidocaine.

No significant variation in SpO_2 was found in both the groups at all points of time during the study. The p value was statistically insignificant as 0.916, 0.727, 0.584, 0.677, 0.393, and 0.592; at baseline, at start of infusion, at end of infusion, just before extubation, just after extubation and in PACU, respectively (Table 2).

Mean systolic blood pressure (SBP) at baseline in Group A (122.94±14.71) and Group B (123.90±9.77) with the p value of 0.702 was comparable. Significant difference was observed in mean SBP just before and after extubation and in PACU, proving dexmedetomidine to be better in maintaining SBP as compared to lidocaine.

Baseline mean diastolic blood pressure (DBP) in Group A (74.50±7.24) and Group B (76.50±9.84) was comparable (p=0.250). Mean DBP at start of infusion in Group A (70.64±7.94) and Group B (73.0±8.72) was comparable (p=0.160).

Significant difference was observed in mean DBP at end of drug infusion, just before extubation, just after extubation and in PACU, proving dexmedetomidine to be a superior drug in maintaining DBP as compared to lidocaine. Further, in Group B, the DBP was more stable and closer to baseline as compared to Group A.

94% of the patients in Group A and 100% patients in Group B had cough score of 1 thereby proving that both the drugs were equally efficacious in attenuating cough during emergence and extubation (p=0.079).

Mean time taken by patient to reach Aldrete score ≥9 in Group A was 28.40±5.93 minutes, whereas in Group B was 38.70±7.48 min, the p<0.001 was statistically significant, implying Group A patients were ready for discharge from PACU significantly earlier compared to Group B patients (Table 3).

Ramsey sedation score was 2 in all the patients of both the groups when patients were ready to discharge from PACU. None of the participants in the study had any adverse effects.

DISCUSSION

In this study, we found that the demographic profile in respect to age and BMI was comparable in both the groups. As far as cough on extubation is concerned, both lidocaine and dexmedetomidine are equally efficacious (p=0.079). The hemodynamic stability (HR, SBP, DBP, and MAP) was statistically better with dexmedetomidine compared to lidocaine, just before extubation and just after extubation and in PACU (p<0.001). No patient had respiratory depression or dysrhythmia in both the study groups. Lidocaine group patients were ready for discharge from PACU statistically earlier than the dexmedetomidine group (p<0.001). None of the patients had any adverse effect in any of the study groups.

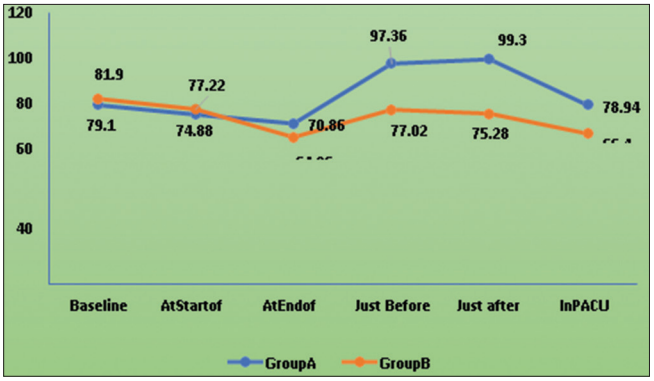

Fig. 1: Effect of study drugs on heart rate

Table 1: Age, BMI, and sex-wise distribution

Variable	Group A	Group B	p-value
Age (years)			
Mean±SD	43.83±15.31	45.40±13.45	0.585
Range	18–65	19–65	
BMI	24.17±3.54	25.03±3.09	0.194
Sex			
Female	21	32	
Male	29	18	

Table 2: Effects of study drugs

Variables	Group A	Group B	p-value
	Mean±SD	Mean±SD	
SpO_2			
Baseline	98.58±0.97	98.56±0.93	0.916
At start of infusion	99.14±1.01	99.20±0.67	0.727
At end of infusion	99.16±0.79	99.24±0.66	0.584
Just before extubation	99.20±0.76	99.28±0.67	0.677
Just after extubation	99.30±0.51	99.18±0.85	0.393
In PACU	99.24±0.52	99.18±0.60	0.592
Systolic blood pressure (mmHg)			
Baseline	122.94±14.71	123.90±9.77	0.702
At start of infusion	118.28±11.12	118.20±11.34	0.972
At end of infusion	112.30±11.50	109.84±12.88	0.316
Just before extubation	134.78±13.84	118.0±16.76	<0.001
Just after extubation	137.72±15.19	116.34±13.68	<0.001
In PACU	122.98±12.41	112.90±12.23	<0.001
Diastolic blood pressure			
Baseline	74.50±7.24	76.50±9.84	0.250
At start of infusion	70.64±7.94	73.0±8.72	0.160
At end of infusion	67.34±9.81	63.42±8.88	0.039
Just before extubation	82.32±11.05	68.42±11.58	<0.001
Just after extubation	84.58±12.12	68.14±9.77	<0.001
In PACU	72.82±7.32	65.02±8.14	<0.001

PACU: Post-anesthesia care unit

Table 3: Study drugs and its relation to early discharge from PACU

Time to reach Aldrete score≥9	Group A	Group B	p-value
Mean±SD	28.40±5.93	38.70±7.48	<0.001

In this study, the mean cough score was 1 in 94% and 2 in 6% of patients in Group A, while in Group B, the cough score was 1 in 100% of the patients (p=0.079). Thus, both the drugs appeared equally effective in attenuating cough reflex at the time of emergence and extubation. Hu *et al*. [1] had same findings as ours.

Another study [5] conducted a comparative study which was in contrast to our study. It was further observed in our study that the mean baseline heart rate in Group A was 79.10±13.50 while in Group B, it was 81.90±7.89/min. Mean HR in PACU was 66.4±7.83/min in Group B while in Group A, it was 78.94±12.71/min, and the difference was statistically significant with p value of <0.001. This showed that dexmedetomidine was much superior in maintaining stable HR than lidocaine. The mean basal MAP in Group A was 90.62±9.10 mmHg and in Group B, it was 93.06±8.14 which was comparable (p=0.161). There was a fall in MAP at the end of infusion in both the groups.

Hu *et al*. [1] compared lidocaine and dexmedetomidine with normal saline and the result was in contrast to our study. Antony *et al*. [6] and Guler *et al*. [7] had shown that dexmedetomidine 0.5 mcg/kg administered as bolus before extubation attenuates the hemodynamic response to extubation which is similar to our results.

Result of Luthra *et al*. was similar to our study in which they found that dexmedetomidine in dose 0.4 mcg/kg has delayed emergence. None of the patients in our study had any adverse effect among any of the two groups. Most of the studies concluded that both lidocaine and dexmedetomidine if used in permissible doses are totally safe. Hu *et al*. [1] had observed bradycardia in dexmedetomidine group. The shortcoming of our study is small sample size. Study with bigger sample size would be needed to validate our findings.

CONCLUSION

We concluded that both lidocaine and dexmedetomidine are safe and reliable drugs which provide very effective attenuation of cough during tracheal extubation without any respiratory depressant effect. Dexmedetomidine is superior to lidocaine in terms of hemodynamic stability at all times (i.e., just before extubation, just after extubation, and in PACU). Lidocaine is statistically better regarding early discharge from PACU.

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