Zagazig University Medical Journal
www.zumj.journals.ekb.eg

https://doi.org/10.21608/zumj.2025.356610.3818 Volume 31, Issue 4, April . 2025

Manuscript ID: ZUMJ-2501-3818
DOI: 10.21608/ZUMJ.2025.356610.3818

ORIGINAL ARTICLE

Intratracheal Dexmedetomidine versus Lidocaine for Smooth Extubation in Patients Undergoing Functional Endoscopic Sinus Surgery

Eman Mohamed Elsayed Elsayed*, Mohamed Shehta Tawfik, Amal Ali Elmalky, Noura Sayed Ahmed El-sayed

Anesthesia, Intensive Care and Pain Management Department, Faculty of Medicine, Zagazig University, Zagazig, Egypt

Corresponding author:
Eman Mohamed Elsayed Elsayed

E-mail:
em5101990@gmail.com

Submit Date: 01-02-2025
Accept Date: 13-02-2025

ABSTRACT

Background: Smooth extubation is a critical aspect of anesthesia management, particularly among patients who undergo functional endoscopic sinus surgery (FESS). Both dexmedetomidine and lidocaine have potential benefits in facilitating smooth extubation, but they operate through different mechanisms. This study aimed to compare smooth extubation in patients undergoing FESS by either intratracheal dexmedetomidine or lidocaine.

Methods: Sixty patients who were undergoing FESS, were involved in this prospective double-blinded randomized controlled clinical trial, they were randomly allocated into three equal groups of twenty cases using a computerized randomization technique. Group C received 4 ml of saline 0.9% , Group D received dexmedetomidine (0.5 µg/kg) diluted then completed to 4 ml of saline 0.9%, and Group L received 4 ml of lidocaine hydrochloride anhydrous 2%, all administrated intralumenal of ETT (Intratracheal), after 10 min after stoppage of nitroglycerin. The primary outcome was the achievement of smooth extubation (Hemodynamic stability, decrease cough and agitation) following FESS. The secondary outcomes included the evaluation of extubation time, Steward Recovery Score (SRS), drug-related side effects.

Results: Heart rates and mean blood pressure (BP) were significantly higher in group C (saline) compared to groups D (dexmedetomidine) and L (lidocaine) at all time points before and after extubation ($p < 0.05$). Postoperative recovery, awakening, and extubation times were significantly longer in group C compared to groups D and L ($p < 0.05$). Group D had more bradycardia and hypotension (30%) than group L (5%) ($p < 0.05$).

Conclusions: Intratracheal Dexmedetomidine and Lidocaine are both effective for attenuating extubation responses among patients undergoing functional endoscopic sinus surgery, with dexmedetomidine showing some advantages in hemodynamic (as regard prevention of hypertension and tachycardia) and extubation quality. Dexmedetomidine was more effective in attenuating cough reflex.

Keywords: Intratracheal Dexmedetomidine; Lidocaine; Smooth Extubation; Functional Endoscopic Sinus Surgery.

INTRODUCTION

Maintaining hemodynamic stability during functional endoscopic sinus surgery (FESS) is one of the most important tasks because good anesthesia increases the success rate of surgery together with improving

postoperative prognosis. An important consideration is the extubation of the trachea, which is one of the most uncomfortable states during general anesthesia, always associated with hemodynamic changes [1].

To help decrease post-extubation hypertensive reactions, laryngospasm, and copious microvascular hemorrhage, the patient must emerge from FESS anaesthesia quickly and smoothly, without coughing or straining, and with full restoration of their protective airway reflexes [2].

Extubation under milder planes of anesthesia or sedation might trigger reflexes by irritating the larynx and trachea. The laryngopharyngeal stimulation relates to a reflex increase in sympathetic activity, which causes hemodynamic alterations. These hemodynamic changes are frequently varied, temporary, and unpredictable, manifesting as an increase in heart rate and arterial blood pressure [3].

Even transitory fluctuations in arterial blood pressure and heart rate can have potentially harmful effects such as increased intracranial pressure (ICP), arrhythmias, myocardial ischemia, left ventricular failure, and pulmonary edema. It is especially harmful in people with systemic hypertension or cardiac disease [4].

A smooth endotracheal extubation is characterized by the absence of laryngospasm, bronchospasm, straining, coughing, bucking, movement, and holding of breath. To attenuate these unpleasant responses, many pharmacological agents have been used, including intravenous opioids, beta-adrenergic blockers, calcium channel blockers, α2 agonists, local anesthetics, and topical sprays or volatile agents [5].

Due to its ease of usage and lack of serious side effects, lidocaine has been extensively tested in several studies to alleviate the cough reflex and facilitate smooth extubation. Lidocaine is delivered via various methods, including intravenous injection, topical spray on the laryngeal inlet, and down the endotracheal tube [6].

Dexmedetomidine, a potent alpha-2 (α2) adrenoceptor agonist that inhibits airway-circulatory reflexes, is highly beneficial and effective for achieving better sedation and analgesia during intubation and extubation, regardless of the method of administration, including intramuscular premedication, intravenous infusion, intranasal, or intratracheal. Furthermore, intratracheal dexmedetomidine instillation has been shown to inhibit laryngeal reflexes due to its quick absorption into the bronchial and alveolar capillary network [7]. So, we aimed in this research to compare smooth extubation after FESS by either intratracheal dexmedetomidine or lidocaine.

METHODS

Sixty patients who were undergoing FESS, were involved in this prospective double-blinded randomized controlled clinical trial at Anesthesia, Intensive Care and Pain Management Department, Faculty of Medicine, Zagazig University Hospitals for six months from May 2024 to December 2024.

After institutional review board (IRB) approval (ZU-IRB#14325/-Feb-2024), all participants were asked to sign an informed consent. Human subjects research adhered to the guidelines set in the Declaration of Helsinki, which is part of the World Medical Association's Code of Ethics.

Sample size*:* Assuming the incidence of no cough was 70% vs 27.5% in lidocaine group vs control group. At 80% power and 95% CI, the estimated sample was 60 cases, 20 cases in each group. (Open Epi) [8].

Inclusion criteria: The study included patients who voluntarily accepted to participate, aged between 21 and 60 years, with a physical status classified as American Society of Anesthesiologists (ASA) I or II. Eligible patients had a body mass index (BMI) ranging from 18 to 30 kg/m² and were scheduled to undergo functional endoscopic sinus surgery (FESS).

Exclusion criteria: We excluded patients who had bronchial asthma, chronic obstructive pulmonary disease (COPD), restrictive lung

diseases, uncontrolled hypertension, or arrhythmias. Other exclusion criteria included major organ diseases such as renal impairment, cardiorespiratory abnormalities, liver failure, significant obesity (BMI > 30 kg/m^2), and recent chest infections within two weeks. Patients with a known allergy or sensitivity to dexmedetomidine or lidocaine, airway tumors, or suspected difficult airway (Mallampati class > 2) were also excluded. Additionally, pregnant or lactating women and patients who refused participation were not included in the study.

Preoperative Preparation:

All participating patients were interviewed preoperatively as part of their preparation for surgery. Patients adhered to fasting guidelines, abstaining from solid meals for 8 hours and clear fluids for 2 hours before surgery. A comprehensive history was taken, including personal details, presenting complaints, systemic comorbidities, current medications, and any previous surgeries. Clinical examinations included an airway assessment using the Mallampati grading system and detailed evaluations of the cardiovascular and respiratory systems.

Baseline measurements such as mean arterial pressure, heart rate, respiratory rate, SPO_2, and body temperature were recorded. Routine laboratory investigations, including complete blood count, liver and kidney function tests, bleeding profile, and random blood sugar, were performed. Patients' physical status was assessed using the ASA I and II classification. Additionally, patients were advised to breathe comfortably through their mouths after surgery and reassured that nasal blockage was an expected temporary condition, encouraging them to remain calm and relaxed.

Intraoperative:

Randomization:

Twenty cases were assigned to each of three equal groups by means of a computer-generated randomization mechanism; all patients were blinded to the allocation process. The patients were randomly divided into three different groups: Group C, which served as a control, Group D, which were given dexmedetomidine, or Group L, which were given lidocaine. The randomization ratio was 1:1:1. Only the research anesthesiologist, just before the procedure, was allowed to access the sealed envelopes containing the randomization assignments. To maintain objectivity in the administration and evaluation, the anesthetist who prepared the medicines as well as the participants were each blinded to their respective groups' assignments.

Anesthetic technique

All patients were given crystalloid infusion at a rate of 6-8 mL/kg/hr as soon as they arrived in the operating room through the insertion of a 20-gauge intravenous cannula into a peripheral vein. Heart rate, MAP, oxygen saturation, and electrocardiogram (ECG) were recorded as baseline data. All three groups used the same anesthetic procedure. Anesthesia was induced with intravenous fentanyl (2 μg/kg), intravenous propofol (2 mg/kg) until verbal communication was lost, and atracurium (0.5 mg/kg) to help with endotracheal intubation, after three minutes of preoxygenation with 100% oxygen. The patients were mechanically ventilated to maintain normocapnia ($ETCO_2$: 35-40 mmHg) and linked to capnography for end-tidal CO_2 ($ETCO_2$) monitoring. Isoflurane (1.2-1.5% in oxygen) and atracurium (0.1 mg/kg) were used to maintain anesthesia.

The procedure was carried out with a target mean arterial pressure (MAP) of 60 mmHg, achieved by inducing hypotension with a nitroglycerine infusion (0.5-2 mcg/kg/min). Nitroglycerine was discontinued either after the completion of the endoscopic procedure or if MAP fell below 60 mmHg. Patients were randomly and blindly allocated into three groups of 20 cases each using a computerized randomization technique: Group C received 4 mL of 0.9% saline; Group D received 0.5 μg/kg dexmedetomidine diluted to 4 mL with 0.9% saline; and Group L received 4 mL of 2% lidocaine hydrochloride. Nitroglycerine was stopped after completion of the endoscopic work or MAP <60 mmHg. Ten minutes after stopping nitroglycerine, the endotracheal tube (ETT) cuff was deflated, and the designated

drugs were sprayed into the ETT lumen. Positive pressure ventilation using bag ventilation ensured the drugs bubbled around the deflated cuff, providing effective laryngotracheal anesthesia. The cuff was then reinflated, and the patient was allowed to emerge from anesthesia.

Extubation was performed once the patient demonstrated adequate tidal volume, a normal respiratory rate, oxygen saturation above 95% on room air, and the ability to obey simple commands. The extubation time was recorded as time from reversal to extubation described by Gonzalez et al. [9].

Data Collection:

Data were collected at three phases: Preoperative data included patients' characteristics such as age, gender, ASA physical status, and BMI. Intraoperatively, hemodynamic parameters including heart rate (HR) and mean arterial pressure (MAP), were recorded at specific time points: H0 (just before drug administration), H1 (5 minutes after drug administration), H2 (at the point of extubation), H3 (2 minutes after extubation), H4 (5 minutes after extubation), H5 (15 minutes after extubation), and H6 (30 minutes after extubation). Post operative data included the duration of surgery, extubation time, awakening time, recovery time, cough reflex and steward recovery score. Awakening time (Time from reversal to opening of eyes on verbal command)

Extubation time (Time from reversal to extubation). Adverse effects of the drugs used, such as allergic reactions to dexmedetomidine or lidocaine, hypotension, hypertension, bradycardia, drowsiness, and confusion, were also recorded.

Hypotension was defined as a decrease in mean arterial pressure (MAP) by 20% or more from baseline. Hypertension was characterized by a MAP exceeding 100 mmHg. Confusion was observed as a state of cognitive impairment marked by mental clouding, disorientation, memory disturbances, and difficulty maintaining attention. Drowsiness was noted as a condition of reduced alertness and increased sleepiness, where individuals experienced a strong urge to sleep or struggled to stay awake. Bradycardia was identified when the resting heart rate fell below 60 beats per minute (bpm).

Study Outcome

The primary outcome of the study was the achievement of smooth extubation following functional endoscopic sinus surgery. Smooth extubation was defined as hemodynamic stability, with minimal variations in heart rate and blood pressure, and a significant reduction in cough and agitation.

The secondary outcomes included the assessment of extubation time, the Steward Recovery Score (SRS) and drug-related side effects.

Statistical analysis

A combination of qualitative and quantitative data was analyzed using IBM SPSS Statistics Version 22.0. The Kolmogorov-Smirnov test was used to check for normality, and all results were assessed for significance at the 0.05 level. For analysis, qualitative data relationships were assessed using the Chi-Square test, a non-parametric method. Quantitative data comparisons between groups utilized the One-Way ANOVA with Post Hoc Tukey for parametric data and the Kruskal-Wallis test with the Mann-Whitney U test for non-parametric data. The significance of the results was expressed in terms of p-values, categorized as non-significant ($p > 0.05$), significant ($p \leq 0.05$), and highly significant ($p < 0.001$), with all results reported as two-tailed probabilities.

RESULTS

The mean ages of patients in roups C, D, and L were 48.2 ± 11.8, 44.5 ± 11.9, and 46.2 ± 12.9 years, respectively, with a p-value of 0.6, Body Mass Index (BMI) means were 23.9 ± 9.1 for Group C, 25.3 ± 7.1 for Group D, and 26.3 ± 10.4 for Group L. Gender distribution analysis revealed that males and females were evenly distributed across the groups (Table 1).

Additionally, the ASA classification results showed that 65% of patients in Group C, 55% in Group D, and 50% in Group L were classified as ASA I. The average surgery durations were 140.2 ± 11.8 minutes for Group

C, 144.5 ± 11.9 minutes for Group D, and 146.2 ± 12.9 minutes for Group L. Overall, the baseline characteristics, including age, BMI, gender distribution, ASA classification, and surgery length, were comparable across the three groups (Table 1).

Regarding heart rate (beats/ minute), Group D exhibited statistically significant decreases at all time points compared to baseline (H0). In Group L, heart rate remained comparable to baseline at most time points but showed significant decreases from H4 to H6. Conversely, Group C demonstrated a statistically significant increase in heart rate at all time points compared to baseline. When comparing heart rates between groups, Group C showed a significant increase ($p < 0.05$) from H1 to H6 compared to both Group D and Group L. Additionally, Group L displayed a statistically significant increase in heart rate compared to Group D at H2, H3, and H4 (Table 2).

Regarding mean blood pressure (mmHg), Group D showed statistically significant decreases at all time points compared to baseline (H0) except at H2 and H6. In Group L, blood pressure was comparable to baseline at most time points but significantly increased from H1 to H3. In contrast, Group C demonstrated a statistically significant increase in all postoperative readings compared to baseline. Group C had a significantly higher BP compared to Groups D and L at H1, H2, H3, H4, H5, and H6. There was also a significant difference between Groups L and D at H3, H4, and H5 ($P<0.05$) (Table 3).

Most patients in Group D (95%) experienced no cough, with only 1 patient (5%) reported minimal cough, and none having moderate or severe cough, Group D demonstrated a statistically significant reduction in cough at grades 0 and 1 compared to Group L, and at grades 0, 1, 2, and 3 compared to Group C. Similarly, Group L had a statistically significant decrease in cough occurrence compared to Group C at grades 0, 2, and 3 ($p < 0.05$) (Table 4). There were no statistically significant differences between the three studied groups in Steward recovery score (SRS) (Table 5).

Group C showed a statistically significant decrease compared to two other groups, while groups D and L did not differ significantly in terms of postoperative awakening time, recovery time, or extubation time ($P <0.05$) (Table 6).

Complication rates, including hypotension, hypertension, bradycardia, and tachycardia, differed significantly among the groups analyzed. Regarding group D and L: bradycardia and hypotension detected in 6 (30%) vs 1 (5%) respectively with statistically significant difference between both groups. In group C: hypertension and tachycardia occurred both in (25%) of cases (Table 7).

Table 1: Baseline characters of studied groups.

	Group C (n=20)	Group D (n=20)	Group L(n=20)	p values
Age (year)	48.2±11.8	44.5±11.9	46.2±12.9	0.6
BMI	23.9±9.1	25.3±7.1	26.3±10.4	0.68
Gender N (%)				
Male	9(45%)	10(50%)	12(50%)	
Female	11(55%)	10(50%)	8(40%)	0.78
ASA classification: N (%)				
ASA I	13(65%)	11(55%)	10(50%)	
ASA II	7(35%)	9(45%)	10(50%)	0.75
Length of surgery (minute)	140.2±11.8	144.5±11.9	146.2±12.9	0.8

Continuous data were represented as mean ± SD, categorical data as number (%), One-way ANOVA, Chi-square test. ASA, American Society of Anesthesiologists, p value >0.05 indicate non-significant difference; p value <0.05 indicate significant difference.

Table 2: Heart rate HR (beat/minute) changes in the studied groups.

Time	**Group C (n=20)**	**Group D (n=20)**	**Group L (n=20)**	**F**	**P value**	**Post-Hoc test**
H0: just before drug administration	84.37±4.6	84.68±3.9	84.15±6.41	0.39	0.6	P1: 0.4 P2: 0.12 P3: 0.6
H1: 5 min after drug administration	98.49±3.34	80.06±4.7	82.6±3.6	2.04	**0.04**	**P1: 0.000** **P2: 0.038** P3: 0.520
H2: at point of extubation	91.82±9.53	75.90±4.87	84.32±5.23	1.34	**0.01**	**P1: 0.01** **P2: 0.01** **P3 0.017**
H3: 2 min after extubation	90.30±6.4	76.72±8.23	81.64±3.97	1.45	**0.01**	**P1: 0.01** **P2: 0.01** **P3: 0.037**
H4: 5 min after extubation	91.25±9.53	75.15±3.59	79.95±4.03	2.32	**0.01**	**P1: 0.01** **P2: 0.01** **P3: 0.002**
H5: 15 min after extubation	1±6.51.89	77.9±7.6	78.85±4.12	2.56	**0.01**	**P1: 0.01** **P2: 0.01** P3: 0.652
H6: 30 min after extubation	88.25±4.28	76.15±3.59	78.20±4.31	1.67	**0.01**	**P1: 0.01** **P2:0.01** P3: 0.11
Comparisons within the same group	P value	P value	P value			
H0 versus H1	**0.000**	**0.001**	0.34			
H0 versus H2	**0.000**	**0.0001**	0.92			
H0 versus H3	**0.001**	**0.000**	0.144			
H0 versus H4	**0.003**	**0.000**	**0.04**			
H0 versus H5	**0.01**	**0.001**	**0.003**			
H0 versus H6	**0.007**	**0.000**	**0.0014**			

Data were represented as mean ± SD, One way ANOVA followed by Bonferroni tests; P1=Comparison between group C and group D; P2=Comparison between Group C and Group L; P3=Comparison between Group D and Group L. p value more than 0.05 indicate non-significant difference; p value less than 0.05 indicate significant difference, LSD (Least significant post hoc test), F (degree of freedom)

Table 3: Mean blood pressure (mmHg) changes in the studied groups.

Time	**Group C (n=20)**	**Group D (n=20)**	**Group L (n=20)**	**F**	**P**	**LSD**
H0: just before drug administration	82.64±3.83	81.75±4.21	81.42±4.15	1.21	0.261	P1:0.537 P2: 0.415 P3: 1.0
H1: 5 min after drug administration	86.95±3.4	79.07±3.2	84.7±3.22	1.01	0.084	**P1:0.00** **P2:0.007** P3:0.46
H2: at point of extubation	86.38±2.73	81.65±4.18	84.43±4.78	1.23	0.01	**P1: 0.000** **P2: 0.014** P3: 0.057
H3: 2 min after extubation	88.22±7.68	78.70±4.28	84.73±5.06	1.34	0.01	**P1:0.000** **P2:0.01** **P3:0.04**
H4: 5 min after extubation	86.5±4.7	79.39±2.91	82.92±4.36	2.34	0.01	**P1:0.01** **P2:0.01** **P3:0.05**
H5: 15 min after extubation	86.82±4.27	78.03±5.48	81.35±4.65	2.12	0.01	**P1:0.01** **P2:0.01** **P3:0.044**
H6: 30 min after extubation	87.89±4.15	80.15±3.59	79.20±4.31	1.67	0.01	**P1: 0.01** **P2:0.01** P3: 0.11
Comparisons within the same group	P value	P value	P value			
H0 versus H1	**0.046**	**0.038**	**0.03**			
H0 versus H2	**0.001**	0.35	**0.007**			
H0 versus H3	**0.006**	**0.028**	**0.02**			
H0 versus H4	**0.007**	**0.048**	0.27			
H0 versus H5	**0.002**	**0.037**	0.43			
H0 versus H6	**0.000**	0.237	0.1			

Data were represented as mean ± SD, One way ANOVA followed by Bonferroni tests, P1=Comparison between group C and group D; P2=Comparison between Group C and Group L; P3=Comparison between Group D and Group L; P value more than 0.05 indicate non-significant difference; p value less than 0.05 indicate significant difference, LSD (Least significant post hoc test), F (degree of freedom).

Table 4: Cough in the studied groups.

Time	Group C (n=20)	Group D (n=20)	Group L (n=20)	P	
No cough (0)	0(0%)	19 (95%)	13(65%)	<0.01	**P1:0.000** **P2:0.000** **P3: 0.043**
Single Cough (1)	9 (45%)	1 (5%)	7(35%)	<0.01	P1:**0.008** P2:0.74 P3:**0.04**
Moderate cough (2)	6(30%)	0 (0%)	0 (0%)	<0.01	**P1:0.02** **P2:0.02** P3----
Severe cough (3)	5(25%)	0(0) %	0 (0%)	0.035	**P1:0.023** **P2:0.023** P3: ----

Data were represented as number (%), Exact fisher test, P1: indicate the difference between group C and group D, P2: indicate the difference between Group C and Group L, P3: indicate the difference between Group D and Group L.

Table 5: Steward recovery score (SRS).

	Group C (n=20)	Group D (n=20)	Group L (n=20)	P
Wakefulness				
No response (0)	0(0%)	0(0%)	0(0%)	990.
Response to stimulation (1)	0(0%)	0(0%)	1(5%)	
Full awake (2)	20(100%)	20(100%)	19(95%)	
Ventilation				
Require airway support (0)	0(0%)	0(0%)	0(0%)	990.
Maintain good airway (1)	1(5%)	2(10%)	1(5%)	
Coughing according to an order (2)	19(95%)	18(20%)	19(20%)	
Movements				
No movement (0)	0(0%)	1(5%)	1(5%)	870.
Non purposeful movements (1)	1(5%)	1(5%)	1(5%)	
Purposeful movements (2)	19(95%)	18(90%)	18(90%)	
Total score				
5	2(10%)	5(25%)	4 (20%)	580.
6	18(90%)	15(75%)	16(80)	

Data were represented as number (%), Exact fisher test, P1=Comparison between group C and group D; P2=Comparison between Group C and Group L; P3=Comparison between Group D and Group L; P value more than 0.05 indicates non-significant difference; p value less than 0.05 indicate significant difference.

Table 6: Detection of awakening, recovery time and extubation time in the studied groups.

Variables	Group C (n=20)	Group D (n=20)	Group L (n=20)	P	LSD
Recovery Time (min)	10.85±1.61	12.95±1.54	13.97±2.1	**0.000**	**P1:0.001** **P2:0.000** P3:0.16
Extubation Time (min)	6.65±1.71	8.84±1.67	7.92±1.32	**0.0002**	**P1:0.001** **P2:0.0352** P3:0.156
Awakening time (min)	8.55±1.51	10.74±1.87	11.98±2.62	**0.000**	**P1:0.0037** **P2:0.000** P3:0.144

Continuous data were represented as mean ± SD, one way ANOVA followed by Bonferroni test; P1=Comparison between group C and group D; P2=Comparison between Group C and Group L; P3=Comparison between Group D and Group L; P value more than 0.05 indicate non-significant difference; p value less than 0.05 indicate significant difference.

Table 7: Postoperative complications in the studied groups.

Variables	Group C (n=20)	Group D (n=20)	Group L (n=20)	P	LSD
Hypotension	0 (0%)	6(30%)	1 (5%)	**0.001**	**P1:0.02** P2:0.99 **P3:0.04**
Hypertension	5(25%)	0(0%)	0(0%)	**0.008**	**P1: 0.047** **P2: 0.047** P3: ------
Bradycardia	0 (0%)	6 (30%)	1 (5%)	**0.001**	**P1:0.02** P2:0.99 **P3:0.04**
Tachycardia	5(25%)	0 (0%)	0 (0%)	**0.008**	**P1: 0.047** **P2: 0.047** P3: ------
Bleeding	1(5%)	0(0%)	0(0%)	0.67	-----
Drowsiness	0 (0%)	0 (0%)	0 (0%)	---	---
Confusion	0 (0%)	0 (0%)	0 (0%)	---	---

Data were represented as number (%), Exact fisher test, P1=Comparison between group C and group D; P2=Comparison between Group C and Group L; P3=Comparison between Group D and Group L; P value more than 0.05 indicates non-significant difference; p value less than 0.05 indicate significant difference.

DISCUSSION

Tracheal extubation is a crucial step during general anesthesia involving the removal of artificial airway when the indication for its placement no longer exists. Airway and circulatory interferences could be due to diminished tolerance to the tracheal tube, catecholamine surge, surgical pain, and airway irritation on behalf of suctioning or change in posture of the tube. Extubation is associated

with a higher risk of complications compared to induction and intubation [10].

Patients having functional endoscopic sinus surgery rely on their anesthesiologists to ensure a smooth extubation. The goal is to minimize airway irritation and prevent complications such as coughing, stridor, and respiratory distress during the recovery phase. Both dexmedetomidine and lidocaine have been investigated for their potential benefits in facilitating smooth extubation, but they operate through different mechanisms [11].

In terms of heart rate, the present study demonstrated that, from H1 to H6, when comparing the two groups, Group C had a significantly greater heart rate than Group L and Group D, respectively. Additionally, at H2, H3, and H4, Group L had a significantly higher heart rate than Group D.

These results were compatible with Mansour et al. [8] who performed a study on intratracheal dexmedetomidine versus lidocaine for smooth tracheal extubation in patients undergoing eye surgery. He demonstrated that values of heart rate (HR) in intratracheal dexmedetomidine group (D) at 0.5 mcg/kg were found to be decreased at all-time points compared with baseline readings and in group L, intratracheal (5ml) 2% of lidocaine it was comparable at all-time points. In contrast, in group C, there was a significant elevation in all postoperative values compared to baseline readings. Regarding comparison between groups, heart rate significantly increased in group C compared with group D and group L from (M3) 10 min after the administration of drugs up to (M10) 30 min after extubation. Also, there was a significant increase in group L compared with group D from (M4) at the end of surgery to (M7) 2 min after extubation.

Another study comparing the effects of dexmedetomidine and lignocaine on hemodynamics, extubation quality, and emergence-agitation response after endotracheal intubation was conducted by Panat et al. [12]. According to their findings, when it came to preserving hemodynamic stability during and after endotracheal extubation, dexmedetomidine outperformed lignocaine. Statistically significant difference was revealed in the two groups' mean heart rates at1,3,5,10,15,20,25, and 30 minutes following extubation as it was lower in dexmedetomidine group than the lignocaine group.

In the same line, Patients undergoing laparoscopic surgery were studied by Hatai and Bagh [13] to determine the impact of intravenous dexmedetomidine and lignocaine on hemodynamic responses and airway reflexes during tracheal extubation. During and after tracheal extubation, he demonstrated that 0.4 mcg/kg of intravenous dexmedetomidine was superior to 1.4 mg/kg of lignocaine in reducing the sympathetic response, as measured by heart rate and blood pressure.

Mean blood pressure (mmHg) changed significantly across groups in this study: With the exception of H2 and H6, all time points in Group D demonstrated a statistically significant reduction in blood pressure compared to baseline (H0).

According to Dutta et al. [14], who investigated the impact of intravenous dexmedetomidine and lignocaine spray administered into the endotracheal tube on the extubation reaction of patients having spinal surgery, this was in line with the findings. He found that 0.3 μg/kg of intravenous dexmedetomidine and 1.5 mg/kg of 10% lignocaine spray effectively reduced hemodynamic responses during extubation as compared to the control group. In comparison to lignocaine, dexmedetomidine reduced hemodynamic and airway responses more effectively, allowing for easier extubation without causing excessive drowsiness.

However, a study comparing the suppressive effects of dexmedetomidine and lidocaine on cough during anesthetic emergence was conducted by Saidie et al. [16]. The study had 120 patients going under general anesthesia. They were divided into three groups and given different amounts of medication 10 minutes before the anesthesia was to begin: 0.5 mcg/kg of intravenous dexmedetomidine and 1.5 mg/kg of intravenous lidocaine, each administered in a

10 mL volume. At various points following extubation, they did not find a statistically significant difference in MAP between the three groups. Possible explanations for the discrepancy between our study's and this one's findings include differences in the timing and method of drug administration, as in this study both drugs were administered intravenously rather than intratracheally, as in our study, Additionally, in this study, anesthesia was maintained through a 75-150 mcg/kg propofol infusion per minute instead of isoflurane, as in our study.

The current study showed significant differences in cough occurrence among the groups. Group D had the lowest cough incidence, followed by Group L, while Group C had the highest and most severe cough occurrences.

Hatai and Bagh [13] also found that when comparing the two drugs, dexmedetomidine produced far better extubation quality (as assessed by the cough score) than lignocaine. In Group A (lignocaine), 35 (72.1%) of the 45 cases evaluated had no cough, while 15 (28.1%) had a slight one. In Group B (dexmedetomidine), 25 (90.1%) had no cough at all, and 20 (10.1%) of the 45 cases had a slight cough.

In contrast to the control group, groups D and L exhibited significantly less severe coughing, as described by Mansour et al. [12]. On the other hand, 87.5% of patients in group D experienced a grade zero cough after surgery, as opposed to 70% in group L.

The results obtained by Hong et al. [17], who investigated the impact of endotracheal 1% lidocaine delivery on emergence phenomena reduction during general anesthesia, corroborated our own findings. He found that a considerable reduction in post-extubation cough was achieved by administering 1% lidocaine intratracheally at a dose of 0.5 mg/kg soon before extubation.

Additionally, a network meta-analysis and systematic review were conducted on drugs that reduce emerging coughing following general anesthesia with tracheal intubation by Tung et al. [18]. One of the effective methods to reduce the incidence of post-extubation cough by 59.2%, compared to placebo, was to provide 1.5 mg/kg of 2% intratracheal lidocaine, as they explained.

In terms of postoperative awakening time, recovery time, and extubation time, the current study indicated that group C had a much shorter duration than both groups, although group D and L did not vary statistically.

Consistent with our results, Mansour et al. [12] found no statistically significant changes in postoperative consciousness or extubation times between D and L Groups, but Group C had significantly shorter recovery, extubation.

However, Hu et al. [20] investigated the impact of lidocaine and dexmedetomidine intravenous infusion on reducing coughing during the time of tracheal extubation following thyroid surgery. In comparison to the lidocaine or control groups, they showed that the dexmedetomidine group (0.5 μg/kg loading, 0.4 μg/kg/h infusion) required more time for extubation. The results of this study differ from ours as different type of surgery as this study was applied in thyroid surgery and both drugs administrated iv infusion until 30 min before the end of surgery.

We found that there was a statistically significant difference between the studied groups regarding complications (hypotension, hypertension, bradycardia and tachycardia). No cases of drowsiness or confusion were detected in the 3 studied groups. In group C: hypertension and tachycardia occurred both in (25%) while bleeding detected in (5%) of cases. Regarding group D and L: bradychardia and hypotension were detected in 6 (30%) vs 1(5%) respectively with statistically significant difference between both groups.

The only significant difference in complications between the study groups, according to Mansour et al. [12], was the degree of sore throat at 15 minutes and 24 hours; group D had a higher score than groups L and C. Three patients (7.5%) in group D, ten (25%) in group L, and nineteen (47.5%) in group C had

hypertension, although the prevalence was higher in group C.

According to Hu et al. [20], dexmedetomidine and lidocaine both had similar effects on postoperative bleeding volume and pain. When compared to lidocaine and normal saline, intravenous infusions of dexmedetomidine caused bradycardia and prolonged the time to awareness.

While only 8% of patients in the group given intravenous 0.5 mcg/kg dexmedetomidine experienced tachycardia response, 84% of patients in the control group did so, according to Liyakhath et al. [20]. The control group experienced a noticeably longer duration of tachycardia and hypertensive response.

CONCLUSIONS

Intratracheal dexmedetomidine and lidocaine are both effective for attenuating extubation responses among patients who were undergoing functional endoscopic sinus surgery, with dexmedetomidine showing some advantages in hemodynamics (as regard prevention of hypertention and tachycardia) and extubation quality. Dexmedetomidine was more effective in attenuating cough reflex.

Conflict of Interest: None.

Financial Disclosure: None.

REFERENCES

1. Shruthi AH, Nethra SS, Sudheesh K, Devika Rani D, Raghavendra Rao RS. Effect of dexmedetomidine on hemodynamic parameters during extubation. A prospective randomized double-blind study. Middle East J Anaesthesiol. 2016;23(4):457-3.
2. Saxena A, Nekhendzy V. Anesthetic considerations for functional endoscopic sinus surgery: a narrative review. J Head Neck Anesth. 2020;4(2):e25.
3. Gaidhankar NT, Mohan KC, Kumar RA, Kumar AN. Alleviating hemodynamic response to tracheal extubation: a comparative study between dexmedetomidine and lignocaine in surgical patients. Indian Anaesth Forum. 2023;24(1):21–8.
4. Anam MA, Mollick MJ, Ahmed F, Rahman A, Rahman MM, Manjari M. Hemodynamic changes during traditional awake extubation and extubation using LMA supreme in controlled hypertensive patients. East Afr Scholars J Med Sci. 2022;5(5):143–7.
5. Niyogi S, Biswas A, Chakraborty I, Chakraborty S, Acharjee A. Attenuation of haemodynamic responses to laryngoscopy and endotracheal intubation with dexmedetomidine: a comparison between intravenous and intranasal route. Indian J Anaesth. 2019;63(11):915–23.
6. Sathonsaowapak P, Ariyanuchitkul T, Chumnaseaw N. Efficiency of pre-extubation intravenous lidocaine on peri-extubation cough. Thai J Anesthesiol. 2022;48(1):45–50.
7. Ibrahim IM, Hassan R, Mostafa RH, Ibrahim MA. Efficacy of dexmedetomidine infusion without loading dose on hemodynamic variables and recovery time during craniotomy: a randomized double-blinded controlled study. Anesthesiol Pain Med. 2021;11(2):1–16.
8. Mansour HS, Zakeria FY, Roushdy ASI. Intratracheal dexmedetomidine versus lidocaine for smooth tracheal extubation in patients undergoing eye surgery: controlled randomized study. Minia J Med Res. 2023;34(4):93–105.
9. Gonzalez RM, Bjerke RJ, Drobycki T, Stapelfeldt WH, Green JM, Janowitz MJ, et al. Prevention of endotracheal tube-induced coughing during emergence from general anesthesia. Anesth Analg. 1994;79(4):792–5.
10. Benham-Hermetz J, Mitchell V. Safe tracheal extubation after general anaesthesia. BJA Educ. 2021;21(12):446–54.
11. Dexter F, Hindman BJ. Narrative review of prolonged times to tracheal extubation after general anesthesia with intubation and extubation in the operating room. Anesth Analg. 2024;138(4):775–81.
12. Panat M. Comparative study of hemodynamic effects, quality of extubation and emergence-agitation response of the patients with dexmedetomidine versus lignocaine during and following the endotracheal extubation. MIJOANS. 2021;19(3):91–5.
13. Hatai SP, Bagh M. A study to assess the effects of intravenous dexmedetomidine and lignocaine on hemodynamic responses and airway reflexes during tracheal extubation in

patients having laparoscopic surgery. Int J Med Rev Case Rep. 2023;6(20):18.
14. Dutta D, Godara M, Purohit S, Kalra P, Sharma SP, Gill N. Comparison of the effect of intravenous dexmedetomidine and lignocaine spray instilled into the endotracheal tube on extubation response in patients undergoing spine surgery. J Neuroanaesthesiol Crit Care. 2016;3(3):239–44.
15. Menshawi MA, Fahim HM. Dexmedetomidine versus lidocaine as an adjuvant to general anesthesia for elective abdominal gynecological surgeries. Ain-Shams J Anesthesiol. 2019;11(1).
16. Saidie S, Modir H, Yazdi B, Moshiri E, Mohammadbeigi A. Comparing the suppressing effect of dexmedetomidine versus lidocaine in cough during anesthesia emergence: a double-blinded randomized clinical trial. J Head Neck Physicians Surg. 2019;7(2):62.
17. Hong SM, Ji SM, Lee JG, Kwon MA, Park JH, Kim S, et al. The effect of endotracheal 1% lidocaine administration to reduce emergence phenomenon after general anesthesia. Anesth Pain Med. 2019;14(2):152–7.
18. Tung A, Fergusson NA, Ng N, Hu V, Dormuth C, Griesdale DEG. Medications to reduce emergence coughing after general anesthesia with tracheal intubation: a systematic review and network meta-analysis. Br J Anaesth. 2019;124(4):480–95.
19. Jafarzadeh E, Modir H, Moshiri E, Barsari FZ, Almasi-Hashiani A. Comparison of dexmedetomidine, lidocaine, magnesium sulfate, and remifentanil in cough suppression during endotracheal extubation: a double-blind, randomized clinical trial. Bali J Anesthesiol. 2022;6(3):171–6.
20. Hu S, Li Y, Wang S, XU S, JU X, MA L. Effects of intravenous infusion of lidocaine and dexmedetomidine on inhibiting cough during the tracheal extubation period after thyroid surgery. BMC Anesthesiol. 2019;19(1):1–8.
21. Prajapati J, Patel M. Comparison of dexmedetomidine and lignocaine on attenuation of pressor responses during tracheal extubation. Asian J Pharm Clin Res. 2022;15(12):70–4.
22. Liyakhath A, Siddhram J, Jagadish MB. Attenuation of hemodynamic stress response during emergence from general anaesthesia: a prospective randomized controlled study comparing fentanyl and dexmedetomidine. J Evol Med Dent Sci. 2014;3(62):13686–97.

Citation

Elsayed, E., Tawfik, M., Elmalky, A., El-sayed, N. Intratracheal Dexmedetomidine versus Lidocaine for Smooth Extubation in Patients Undergoing Functional Endoscopic Sinus Surgery. Zagazig University Medical Journal, 2025; (1604-1616): -. doi: 10.21608/zumj.2025.356610.3818