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Original Article

Comparison of Post Extubation Cough with Instillation of 2% Lidocaine Versus Air in Endotracheal Tube

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ABSTRACT

***Objective*:** To determine the efficacy of 2% Lidocaine instillation for endotracheal tube cuff inflation versus air on post-extubation cough.

***Study Design*:** Quasi-experimental study.

***Place and Duration of Study*:** Combined Military Hospital, Rawalpindi Pakistan**,** from May to Nov 2018.

***Methodology*:** The study was carried out on 64 patients undergoing surgery under general anaesthesia of a duration greater than one hour. Patients with respiratory pathology, risk of aspiration, difficult airway, and who need postop ventilator support were excluded. Patients were divided into Group-A (inflated with air) and Group-L (inflated with 2% Lidocaine) by sealed opaque envelop method. Post-extubation cough and one hour later was recorded.

***Results*:** The mean age of Group-A and Group-L was 30.06±4.36 years and 29.66±4.45 years, respectively. 43(67.19%) participants were males, whereas 21(32.81%) were females. The efficacy of 2% Lignocaine versus air in endotracheal cuff on post-extubation cough and one hour following extubation in Group-A was 19(59.38%) and 11(34.38%), respectively. This was reduced to 06(18.75%) and 1(3.13%) in Group-L, respectively (p<0.05).

***Conclusion*:** This study concluded that using 2% Lidocaine for inflation of the endotracheal tube cuff decreases the cough frequency after extubation compared to air.

Keywords: Endotracheal tube, Extubation, Lidocaine, Post-operative cough.

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INTRODUCTION

Tracheal intubation is considered the most acceptable airway management due to its oxygenation, regurgitation and pulmonary aspiration prevention reliability. However, tracheal intubation requires enormous clinical expertise.[1]

Significant anatomic features required for endotracheal intubation are adequate mouth opening with temporomandibular joint mobility, pharyngeal space, submandibular space and suitable cervical spine extension. Variation can result in intubation challenges.[2] Minor complications encountered after laryngoscopy and endotracheal intubation are sore throat, lips or gums lacerations, teeth knock and nasal trauma. Potentially serious consequences include bronchospasm, exaggeration of heartbeat, blood pressure and intracranial pressure.[3,4]

Various studies have shown that the use of minimum effective cuff inflating volume intraoperatively markedly reduces complications like irritation, sore throat, and cough postoperatively.[5, 6]

Non-pharmacological and pharmacological methods are used to minimize the incidence of cough following extubation. Pharmacological strategies are more effective and include using opioids, anti-inflammatory drugs, steroids, or lignocaine. The most commonly used is lignocaine, which protects the tracheal mucosa from irritation.[7,8] Lignocaine slowly diffuses out from the cuff of the endotracheal tube and produces its local anaesthetic effect on the mucosa. [9,10] The objective of the study was to compare the effectiveness of 2% Lidocaine versus air instilled in endotracheal tube cuff to establish a better modality for reducing post-extubation cough.

METHODOLOGY

The Quasi-Experimental Study was conducted at Combined Military Hospital Rawalpindi from May 2018 to November 2018. Approval was taken from the Ethical Research Committee (ERC 05A/2018) of the hospital. The sample size was calculated using the WHO sample size calculator with the anticipated population proportion of patients with cough on extubation (P1 - Air) as 54% and (P2-Lignocaine) 16%.[11]

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Inclusion Criteria: Patients of either gender, undergoing elective surgery from ASA Class I and II were included in the study.

Exclusion Criteria: Patients with a history of obesity, hypertension and bronchial asthma were excluded from the study.

The consecutive non-probability technique was used. Written informed consent was taken a day before surgery, and a pre-anesthesia assessment was done. The patient was kept nil per oral and divided randomly into groups A and B by lottery. In Group-A, the ETT cuff was inflated with air; in Group-L, the ETT cuff was inflated with 2% Lidocaine.

In the operation theatre, intravascular access was maintained. Monitoring, including electrocardiography, pulse oximeter, non-invasive blood pressure as attached, and baseline vitals were noted. The patient was pre-oxygenated with 100% O2, premedicated with injection of Nalbuphine 0.1mg/kg IV, injection of Dexamethasone 8mg iv, injection of Metoclopramide 10mg IV, and then induction was done by injection of Propofol 2.0 mg/kg IV and injection Atracurium 0.5 mg/kg iv to facilitate tracheal intubation according to the standard protocol.

Laryngoscopy followed by tracheal intubation was done using an endotracheal tube size of 7.0mm ID for females and 7.5-8 mm for males. The endotracheal tube cuff was inflated with air or Lignocaine 2%, preventing air leak from the endotracheal tube.

Maintenance of anaesthesia was done with Isoflurane 1.2% to 1.5% and oxygen. Muscle relaxant injection Atracurium 0.1mg/kg IV was given as a maintenance dose. An 8–10 mL/kg tidal volume was given to maintain ETCO2 within the permissible limits.

Neuromuscular blockade antagonized with injection of Neostigmine 2.5mg IV and injection of Glycopyrrolate 0.5 mg IV followed by gentle suctioning at the end of surgery. After the return of muscle activity, the inhalational agent was stopped, and 100% oxygen was given. Extubation was done when there was a complete return of muscle activity, and the patient obeyed verbal commands. Post extubation, a cough was recorded one hour later. “YES" denoted the presence of a cough, and “NO" pronounced the absence of a cough.

Statistical Package for Social Sciences (SPSS) version-20 was used for data entry and analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics.The *p*-value of ≤0.05 was considered statistically significant.

RESULTS

Sixty-four patients aged 20-40 years and a mean age of 29.73±4.41 years participated. Out of 86 patients, 43(67.19%) were males, and 21(32.81%) were females, (Table-I). The mean BMI was 28.52±3.63 kg/m2. Cough at extubation in Group-A was present in 19(59.4%), whereas 13(40.6%) did not have a cough. In Group-L, the cough was present and absent in 06(24.0%) and 26(66.0%), respectively (*p*–value 0.002). When results were recorded at 60 minutes, Group-A had a cough in 11(34.38%), and 21(65.62%) did not have a cough. In Group-L, the cough was present and absent in 01(3.13%) and 31(96.87%) (*p*-value 0.001). The efficacy of 2% lignocaine vs. air in endotracheal cuff on post-extubation cough was shown one hour later (Table-II).

Table-I: Demographic Profile of Patients (n=64)

Age (years)	Group-A (n=32)		Group-L (n=32)	
	No. of Patients	%Age	No. of Patients	%Age
20-30	14	43.75	15	46.87
31-40	18	56.25	17	53.13
Mean±SD	30.06±4.36 years		29.66±4.45 years	
Gender	**Group-A (n=32)**		**Group-L (n=32)**	
	No. of Patients	**%Age**	**No. of Patients**	**%Age**
Male	22	68.75	21	65.63
Female	10	31.25	11	34.37

Table-II: Comparison of Efficacy of 2% Lidocaine instillation for Endotracheal Tube Cuff Inflation vs Air on Post-Extubation Cough (n=64)

Efficacy	Group-A (n=32)		Group-L (n=32)		*p*-value
	Yes	No	Yes	No	
Cough at extubation	19 (59.4%)	13 (40.6%)	06 (24.0%)	26 (66.0%)	0.002
Cough at 60 minutes	11 (34.38%)	21 (65.62%)	01 (3.13%)	31 (96.87%)	0.001

DISCUSSION

The reported occurrence of post-extubation cough is 38-96%11 attributable to lack of lubrication of ETT in the humidification of gases, N2O diffusion, or number of intubation trials. Over-inflation can cause tracheal ischemia, and under-inflation is a potential risk for aspiration. Air, saline, Soda bicarb and lignocaine were employed to inflate the endotracheal tube cuff. This study's results supported the efficacy of 2% Lidocaine instillation for endotracheal tube cuff inflation versus air on post-extubation cough. Gaur *et al*. compared the efficacy of 2% lignocaine versus air in endotracheal

cuff post-extubation cough and one-hour following extubation. When the air was used, 54% had an immediate post-extubation cough, and 30% had a cough one hour later. This was reduced to 16% and 6% with 2% lignocaine. In this study, the efficacy of 2% lignocaine vs air in endotracheal cuff immediately post-extubation cough and one hour later was with air 19(59.38%) and 11(34.38%), respectively. This was reduced to 6(18.75%) and 1(3.13%) when 2% lignocaine was used, respectively (p<0.05).[11]

Lignocaine as an agent to combat post-extubation morbidity was studied by Soltani *et al*. via different routes of administration, with intracuff drug delivery found to be the most effective in this regard.[12] The meta-analysis conducted by Tanaka *et al.* favoured lignocaine therapy for controlling the risk and severity of postoperative sore throat.[13]

However, a study by Estebe *et al*. failed to demonstrate the efficacy of non-alkalinized 4% Lidocaine instillation in diminishing post-extubation cough in smokers undergoing surgery under general anaesthesia for less than 90 minutes. Due to alkalization, lignocaine's hydrophobic neutral base form showed greater diffusion across the cuff (65% in six hours) versus the charged hydrochloride form (1% diffusion) to intercept the tracheal receptors. Hence, greater lignocaine hydrochloride (200-500 mg) is required for clinical manifestation. 8.4% NaHCO3 addition has desirable effects with smaller lignocaine doses (20-40 mg).[14]

Huang *et al*. compared Lidocaine 4% and alkalinized Lidocaine to evaluate post-emergence cough and sore throat. They concluded that alkalinized and warmed Lidocaine pre-stored in the ETT cuff had a favourable emergence outcome.[15] Porter *et al*. concluded compatible results with Lidocaine, air, and saline on post-operative sore throat. Various factors associated with post-extubation cough and sore throat are ETT cuff design, ETT size, intubation technique, laryngoscopy blade, and suctioning technique, which can alter results.[16]

A study conducted by Fagan *et al*.[17] concluded that inflation of the cuff of the ETT with Lidocaine rather than saline or air can reduce the incidence of coughing in the initial post-extubation period; however, Fagan and colleagues used Lidocaine 4% in this study, whereas we used Lidocaine 2%. Other studies done by Navarro and colleagues support this study. They suggested cuff instillation with alkalinized Lidocaine to prevent high cuff pressures during N2O anaesthesia, reducing ETT discomfort and post-operative sore throat.[18]

More studies should be carried out on a larger sample size to affirm these results. Moreover, the instillation of lignocaine might increase the pressure in the endotracheal cuff, leading to increased pressure on the tracheal wall and occluding the blood supply.

CONCLUSION

This study concluded that using 2% Lidocaine for inflation of the endotracheal tube cuff decreases the cough frequency after extubation compared to air. Therefore, we recommend that 2% Lidocaine for inflation of the endotracheal tube cuff should be used in every patient undergoing endotracheal intubation to prevent post-operative cough and morbidity of the patients.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

JZ & BM: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

RI & SA: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

SH & UH: Concept, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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