ORIGINAL ARTICLE

Lidocaine 4% spray is better than intracuff lidocaine 2% for reducing the incidence of post-extubation cough in patients undergoing total abdominal hysterectomy

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ABSTRACT

Objective: Cough at extubation and postoperative sore throat are common complications in patients receiving general anesthesia with tracheal intubation. Different strategies have been used to reduce these effects. In this double blind controlled trial, we evaluated the effects of lidocaine sprayed onto the larynx and injected into tracheal tube cuff to decrease the incidence of cough at extubation and postoperative sore throat in patients undergoing total abdominal hysterectomy (TAH) under general anesthesia.

Methodology: One hundred women, aged 40-60 years, scheduled for TAH under general anesthesia were included in this randomized double blind prospective study. After induction of general anesthesia, just before tracheal intubation, glottus was sprayed by 4 % lidocaine or 0.9% saline through a syringe with 4 ml volume. After tracheal intubation, the tracheal tube cuff was filled with 4 ml of 2% lidocaine solution or 0.9% saline. In this way four groups were formed; spray-cuff group (lidocaine spray and lidocaine in cuff), spray-saline group (lidocaine spray and saline in cuff) , saline-cuff group (saline spray and lidocaine in cuff) , and saline-saline group (saline spray and saline in cuff) , having 25 patients in each groups. The primary outcome was the incidence of cough at extubation. The incidence and severity of sore throat was recorded at 15 min, 60 min and 24 hrs post-extubation using visual analogue scale (VAS, 0=no pain, 10= worst pain imaginable) as a secondary outcome.

Results: All patients completed the study. Cough was noted in 20%, 16%, 76%, and 84% of patients in the spray-cuff group, spray-saline group, saline-cuff group and saline-saline group respectively. The spray of lidocaine onto the larynx resulted in decreased incidence of cough at extubation (P value < 0.001). But the intracuff lidocaine did not show any decrease in the occurrence of cough or reduction in the incidence and severity of sore throat as it remained low in all groups.

Conclusion: Use of lidocaine spray onto the larynx resulted in significantly decreased incidence of cough at tracheal extubation in patients undergoing TAH. However, the use of lidocaine into endotracheal tube cuffs had no effect on the incidence of cough or sore throat.

Key words: Lidocaine spray; Cough; Postoperative sore throat; Total abdominal hysterectomy

Citation: Khan MA, Siddiqi KJ, Aqeel M. Lidocaine 4% spray is better than intracuff lidocaine 2% for reducing the incidence of post-extubation cough in patients undergoing total abdominal hysterectomy. Anaesth Pain & Intensive Care 2014;18(2):162-166

INTRODUCTION

Postoperative sore throat, dysphagia and dysphonia are well recognized complications of general anesthesia due to local irritation of laryngopharyngeal mucosa caused by tracheal intubation, and occur in approximately 50% of cases.[1-3] Similarly, post-extubation cough causes considerable patient discomfort and can result in a number of undesirable side effects like hypertension, tachycardia, tachyarrhythmia, increased intracranial pressure, and

increased intraocular pressure.[4,5] Previous studies show that the incidence of post-extubation cough ranges from 40 to 96 %.[6-9] Different measures, non-pharmacological and pharmacological, have been proposed to decrease these adverse effects. Non- pharmacological measures include use of smaller-sized endotracheal tubes, lubricating the endotracheal tube with water-soluble jelly, careful airway instrumentation, intubation after full relaxation, gentle oropharyngeal suctioning, minimizing intracuff pressure, and extubation in a deeper plane of anesthesia and with a fully deflated tracheal tube cuff.[10,11] Pharmacological measures include the administration of opioids, use of steroid ointment, and injection of intravenous lidocaine.[12-16] Topical local anesthetics represent an attractive alternative to suppress cough while maintaining rapid awakening. Administration of 2-4% lidocaine to the glottic area before the end of surgery was associated with a 32-69% decrease in the incidence of cough.[17,18] Some anesthetists have tried to lubricate the ETT cuff to decrease mucosal irritation.[6,7,19,20] Intracuff alkalinized 2% lidocaine has shown a decrease in the incidence of cough than a cuff filled with air or lidocaine alone in surgeries of more than two hours.[6,7] However, all these techniques have their own limitations, variable success rate; and none of these, when used alone, suppressed cough entirely at extubation. Therefore, this study was planned to evaluate the efficacy of lidocaine sprayed locally onto the larynx and/or the effect of intracuff lidocaine for the prevention of cough at extubation and postoperative sore throat in patients undergoing TAH.[21]

METHODOLOGY

This randomized double-blind prospective study was done in operating rooms of Fatima Memorial Hospital, Lahore from April 2013 to January 2014.

After approval from hospital ethics committee, one hundred women of ASA I & II, aged 40-60 years, scheduled for TAH under general anesthesia of less than two hours in duration were included in the study. Informed consent was taken from all of the participants. The sample size was calculated on the basis of an estimated incidence of coughing of 70% from a previous study.[5] Using a p-value ≤ 0.05 and a power of 0.8, 25 patients in each group were calculated to be adequate. The patients with symptomatic gastric reflux despite medication; history of, or anticipated difficult airway; a nasogastric tube in place; an upper respiratory tract infection in the last month; history of pulmonary disease; and lidocaine hypersensitivity were excluded from the study.

These 100 patients were divided into four equal groups having 25 patients in each group labeled as A_1A_2, B_1B_2, C_1C_2 and D_1D_2 groups. 1 for syringe one and 2 for syringe two.

- A_1A_2 group [spray-cuff group] (lidocaine spray A_1 and lidocaine in cuff A_2)
- B_1B_2 group [spray-saline] (lidocaine spray B_1 and saline in cuff B_2)
- C_1C_2 group [saline-cuff] (saline spray C_1 and lidocaine in cuff C_2), and
- D_1D_2 group [saline-saline] (saline spray D_1 and saline in cuff D_2).

A randomization list was generated by simple random allocation. 25 slips of each group (A_1A_2, B_1B_2, C_1C_2 and D_1D_2 groups) were put into box and then taken out one by one to allocate a number to a patient from 1 to 100. This list remained with nonparticipating anesthesiologist who prepared all solutions for spray (syringe 1) and cuff (syringe 2). Anesthetist who gave anesthesia was blinded and similarly the nurse who collected data postoperatively was also blinded. Each of the patients was shown the visual analogue scale (VAS) preoperatively and was explained how to rate their severity of pain of postoperative sore throat on the scale. [VAS 1-3, mild, 4-7 moderate and 8-10 severe pain].

Anesthetic technique was standardized for all groups. General anesthesia was given to all patients. All patients received tablet midazolam 7.5 mg orally with a sip of water one hour before induction of anesthesia as a premedication. Patients received inj. propofol 2 mg/kg, atracurium besylate 0.5 mg/kg and nalbuphine 0.15 mg/kg IV at induction. They were ventilated with 40% oxygen in nitrous oxide (N2O) with isoflurane 0.6-1%, using circle system with a flow of 6 liters for 3 minutes. Patients were intubated using 7.5 mm ID endotracheal tube (ETT) with large-volume low-pressure cuff. Before tracheal intubation, 4 ml of 4% lidocaine hydrochloride or 0.9% saline was sprayed onto the layrnx with a syringe. The ETT cuff was filled with 2% lidocaine or 0.9% saline with a syringe having 4 ml volume to obtain a seal. An additional volume of air/ saline was used to inject into the ETT cuff to obtain a seal if required. Anesthesia was maintained using 40% oxygen in nitrous oxide and isoflurane 0.6 - 1.0 % reducing flows to 3 lit/ min after 8 minutes. Muscle relaxation was maintained using inj. atracurium besylate 10 mg on appearance of one twitch on train of four (TOF).

No other local anesthetic was used during the procedure by either the anesthesiologists or by the surgeons. At the end of the surgery, every patient received ondansetron 4 mg IV.

On skin stitching, isoflurane was switched off. After return of two twitches on train of four (TOF), inj. neostigmine 2.5 mg and glycopyrrolate 0.4 mg were administered in fixed dose in all patients. Pharyngeal secretions were gently aspirated before the isoflurane vaporizer was turned off.

Tracheal extubation was performed when the patients were responsive to verbal commands and occurrence of cough was noted at and immediately after extubation.

All patients were monitored using ECG, pulse oximetry, noninvasive blood pressure, end tidal capnography and neuromuscular function monitor (nerve stimulator).

For postoperative analgesia, patients with VAS >3 received nalbuphine 0.05 mg/kg IV every two hours.

Outcomes Variables: Cough at tracheal extubation was the primary outcome of this study and was determined during the time interval from the moment of tracheal extubation until appropriate spontaneous and unassisted ventilation established after extubation. In this period of time, the patient remained unstimulated on the operating room table. The anesthetist blinded from group assignment noted "yes" or "no"on the evaluation performa regarding presence or absence of cough. For the secondary outcomes, patients were assessed regarding severity of sore throat using a visual analogue scale (VAS 0-10) at 15 min, one hour, and 24 hours after extubation. The designated nurse who was blinded regarding the treatment groups collected this information.

Statistical analysis: The incidence of cough among the four groups and postoperative sore throat was analyzed using the Chi square test and was expressed as percentage and frequencies. P-value less than 0.05 was considered significant. Normally distributed continuous data were reported as the mean with standard deviation. All analyses and plotting was performed with SPSS version18.

RESULTS

All selected patients completed the study having 25 patients in each group. Thus, data from 100 patients were included and analyzed.

Baseline demographic and clinical characteristics were similar in all groups. The ages of patients ranged between 40 and 60 years with mean 48 ± 6years,47± 5, 51± 6 and 47± 5 for spray-cuff, spray-saline, saline-cuff and saline-saline groups respectively. The mean weights of four groups were 71± 6 kgs, 67± 6 kgs, 73±7 kgs and 73±8 kgs respectively (Table 1).

Table 1: Patients Demographic Data

Group	Age (years) Mean ± SD	Weight (kilograms) Mean ± SD
A_1A_2 (Spray-Cuff)	48	71 6
B_1B_2 (Spray-Saline)	47	67
C_1C_2 (Saline-Cuff)	51	73
D_1D_2 (Saline-Saline)	47	73

The vital signs like blood pressure, heart rate remained stable in all four groups. The incidence of cough was 20%, 16%, 76%, and 84% in spray-cuff, spray-saline, saline-cuff, saline-saline group respectively with p-value of <0.001 which was very significant (Table 2).

Table 2: Cough at extubation (primary outcome)

Group	No		Yes	
	Frequency (n)	%	Frequency (n)	%
A_1A_2 (Spray Cuff)	20	80	5	20
B_1B_2 (Spray Saline)	21	84	4	16
C_1C_2 (Saline Cuff)	6	24	19	76
D_1D_2 (Saline Saline)	4	16	21	84

Significant p-value < 0.001

Overall severity of sore throat was mild with VAS ≤ 3 in 77% of the total patients (22 cases in spray-cuff, 16 in spray-saline, 17 in saline-cuff and 22 in saline-saline groups), moderate with VAS 4-6 in 16% (No case in spray-cuff, 8 in spray-saline, 7 in saline-cuff and 1 case in saline-saline) of the patients (p-value=0.016 statistically significant). None of the patients developed severe sore throat (Table 3).

Table 3: Sore throat severity (secondary outcome)

Group	No		Mild (VAS 1-3)		Moderate (VAS 4-6)		Severe (VAS 7-10)	
	n	%	n	%	n	%	N	%
A_1A_2 (Spray Cuff)	3	12	22	88	0	0	0	0
B_1B_2 (Spray Saline)	1	4	16	64	8	32		
C_1C_2 (Saline Cuff)	1	4	17	68	7	28		
D_1D_2 (Saline Saline)	2	8	22	88	1	4		

Significant p-value < 0.016

DISCUSSION

In this study, we observed that use of 4% lidocaine spray onto the glottic area decreased the incidence of cough at extubation in patients undergoing TAH under general anesthesia with less than two hours duration of surgery. However, the lidocaine 2% injected into tracheal tube cuffs did not show any significant reduction in the incidence of post-extubation cough or sore throat.

Coughing at extubation is associated with some detrimental postoperative complications. These effects are especially harmful in high risk hypertensive, cardiac patients and those with raised intracranial pressure.[4,5]

Activation of sensory receptors of respiratory tract by mechanical or chemical stimuli can trigger cough,[22] while it is inhibited by some agents.[23]

One study conducted by Minogue et al using preintubation lidocaine for laryngotracheal topicalization showed reduction in the incidence of cough on emergence from general anesthesia.[5] Our findings are comparable to the results of this study but for patients of TAH. Our study showed no decrease in the incidence of cough with the use of intracuff lidocaine alone and intracuff lidocaine did not potentiate the effects of sprayed lidocaine in preventing the cough in contrary to the results of an earlier study by Estebe et al. They reported that using intracuff lidocaine in patients undergoing surgeries of approximately 60 min duration had little impact on occurrence of periextubation cough.[8] This study was done in patients of thyroidectomies in which they applied local anesthetics to the larynx liberally. This might cause additive effect in reducing the cough reflex. In our study, we used a strict standardized anesthetic protocol for both surgical and anesthesiology teams and this study was done in gynecological patients in which surgical site was distant from the airway structures. One difference was that air was used in cuffs in the control group instead of liquid. In our study, we tried to evaluate the reduction in the severity of pharyngolaryngeal pain by using lidocaine 4% spray. In the study by Minogue et al., the authors evaluated the efficacy of the lidocaine with respect to occurrence of cough only but not sore throat.[5] In some studies, the endotracheal tube cuffs were lubricated with some gel like 10% lidocaine, sterile water, or water soluble gels.[6-8, 19,20] However, in our study we did not lubricate outside wall of the cuff membrane prior to its use.

The VAS scores for sore throat severity recorded in our study were in the low range (≤ 3) in 77% of the cases, almost similar to those reported by Estebe et al[6,7] or by Navarro et al[20] at one hr and 24 hrs. Our study showed that 4% lidocaine spray combined with intracuff 2% lidocaine did not potentiate the reducing effect on severity of sore throat. However, our results showed a low level of throat pain irrespective of use of lidocaine or saline in ETT cuff. This study has some relevance with a previous observation by Navarro et al that showed intracuff alkalinized lidocaine resulted in less irritation on the throat than air-filled cuffs at 24 hours post-extubation.[24] We used only 2% lidocaine without alkalinization and no air in the tube cuffs.

CONCLUSION

Use of 4% lidocaine hydrochloride spray onto the laryngotracheal areas before intubation decreased the incidence of cough at extubation in patients undergoing TAH of less than two hours duration but addition of 2% intracuff lidocaine did not show any potentiating effect on the incidence of postextubation cough. However, neither the lidocaine spray nor intracuff lidocaine had any effect on the severity of sore throat.

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