Lidocaine Nebulizer reduce response to endotracheal intubation and the need for postoperative analgesia after nasal operations

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Abstract: Objectives: The aim of this study to investigate whether lidocaine nebulizer attenuates airway-circulatory reflexes during induction and emergence, tube tolerance, nasal pack tolerance and reduced total dose of opioid analgesia **Patients and methods:** This prospective, randomized, placebo controlled, double blind clinical trial was conducted on 60 patients scheduled for nasal surgery under general anesthesia were randomly allocated into two equal groups: **Group A (Study group)** was given Lidocaine 2% (2 mg/kg) in 5 ml saline was added to a standard nebulizer with a full face mask attached with O_2 flow at 3 L/min., then the patient was asked to inhale the local anesthetic vapor deeply for 15 minutes and **Group B (control group)** was given5 ml saline 0.9% was added to a standard nebulizer with a full face mask attached with O_2 flow at 3L/min. over 15 minutes. Hemodynamic parameters, tube tolerance, nasal pack tolerance, amount of bleeding, time to first analgesic request, total Morphine consumption over the 1st 24 hours and postoperative pain score were recorded. **Results:** Patient's tolerance to endotracheal tube in the study group showed a highly significant increase in numbers of patients in grade 0 and highly significant decrease in numbers in grades 1 and 2 in comparison with the control group. The study group showed better tolerance to nasal pack than the control group. The amount of blood collected was significantly higher in the study than the control group. Time to 1st analgesic request was highly significant longer in study group than control group. Total morphine dose given to patients in the 1st 24 hours postoperatively was significantly higher in the control group than the study group. **Conclusion:** Lidocaine nebulizer technique is simple effective way to suppress the cough and hyper dynamic reflex responses with minimal side effect.

[Ahmed M. Abd El-Hamid, Ali M. Hasan, M. Hamed Abd El-fattah and Ahmed Shehata. Lidocaine Nebulizer reduce response to endotracheal intubation and the need for postoperative analgesia after nasal operations. *J Am Sci* 2013;9(12): 287-291]. (ISSN: 1545-1003). http://www.jofamericanscience.org. 40

Keywords: Lidocaine Nebulizer, endotracheal intubation, postoperative analgesia, nasal operations.

1. Introduction

Lidocaine is one of the most frequently used local anesthetics and is available in multiple dosage forms. It is also routinely administered by infiltration prior to a number of procedures and by various techniques for peripheral and epidural anesthesia. One of the more unusual uses of lidocaine is in the management of cough. Lidocaine has been evaluated in numerous trials as a spray or gel to suppress acute cough associated with bronchoscopy, lung biopsy and laryngoscopy [(1)]. It has also been used to reduce the incidence of postoperative sore throat, cough, and hoarseness of voice. This anesthetic has also been given via nebulizer for intractable cough in terminal patients. More commonly, lidocaine inhalation has been utilized to reduce the frequency of chronic cough in patients with asthma and chronic obstructive lung disease (COPD). This route of administration appears to produce low serum levels and a reduced frequency of adverse effects compared to gel or spray formulations [(2)].

Lidocaine has long been used to modulate the physiologic responses to intubation, emergence and tracheal extubation via several routes including IV injection [(1, 3, 4)], endotracheal tube cuff, or laryngo-tracheal instillation of topical anesthesia [(5, 6)], However, IV lidocaine may prolong emergence from general anesthesia[(7)].

Nasal surgeries usually associated with mild to moderate postoperative pain related to both surgical trauma and nasal packing [(8)]. Local anesthetics are sometimes used to decrease pain resulting from nasal packs and surgery itself [(9, 10)].

The aim of this study was to investigate whether lidocaine nebulizer attenuates airway-circulatory reflexes during induction and emergence, tube tolerance, nasal pack tolerance and reduced total dose of opioid analgesia in comparison to placebo group.

2. Patients and method:

After local ethical committee approval and patients informed written consent, this prospective, randomized, placebo controlled, double blind clinical trial was conducted on 60 patients with class I and II ASA(American Society of Anesthesiologist) .These patients were scheduled for nasal surgery (Sinuscopy,

turbinectomy and polypectomy) under general anesthesia. Risk and benefits were explained to all patients and also side effects to the local anesthetic.

Patients were randomly allocated by using a computer generated random number table into two equal groups:

Group A (Study group): Lidocaine 2% (2 mg/kg) in 5 ml saline was added to a standard nebulizer with a full face mask attached with O_2 flow at 3 L/min., and then the patient was asked to inhale the local anesthetic vapor deeply for 15 minutes.

Group B (control group): 5 ml saline 0.9% was added to a standard nebulizer with a full face mask attached with O_2 flow at 3L/min. over 15 minutes.

Uncooperative patients, patients with known history of allergy to local anesthetic, or if they had significant comorbid disease, such as bronchial asthma, hepatic or renal impairment, epilepsy, cardiac disease, cognitive dysfunction, or neurologic disease were excluded from the study.

After 3 minutes pre-oxygenation general anesthesia was induced with Fentanyl 2 micg/kg, Propofol 1.5 mg / kg and Recrunium bromide 0.6 mg / kg and maintained with sevoflorane 2% in 100% O_2 and incremental doses of Recrunium bromide 0.2 mg/kg every 30 min. if needed. Intraoperative hypertension (BP >30% of the preoperative level) was controlled by nitroglycerin infusion. Tachycardia (HR > 20 of the preoperative level) was controlled by Esmolol 50 micg /kg.

Intraoperative monitoring includes ECG, NIBP, SPO2 and end tidal CO_2.

Morphine 2 mg IV was given if visual analogue score was ≥ 5.

Primary outcome was the **Tube tolerance** grades:

- **Grade 0** - well tolerated = no straining
- **Grade 1** - mildly tolerated = mild straining
- **Grade 2** - intolerable = coughing, straining and bucking) at induction and recovery is guided by straining or bucking

Secondary outcome included all the following parameters:

1- **Hemodynamic parameters:** Mean blood pressure and heart rate at the following intervals: baseline before induction, after intubation, every 10 minutes after intubation throughout the procedure, at extubation, every 2 hours postoperatively till 12 hours and every 4 hours till 24 hours.
2- **Nasal pack tolerance at the 1st 6 hours postoperative:**
   - **Grade 0 -** Tolerable
   - **Grade 1 -** Discomfort
   - **Grade 2 -** Intolerable
3- **Bleeding:** This was the total amount of blood collected by suction during surgery.
4- **Time to first analgesic request.**
5- **Total Morphine dose over the 1st 24 hours.**
6- **Postoperative pain score:** was recorded using numerical pain score every 6 hours.

3. Results:

Demographic characteristics of patients showed non-significant difference between groups as regard age, sex, weight, ASA physical status and operative time **(Table 1)**.

As regard the type of operation, there was a non-significant difference between the 2 groups **(Table 2)**.

As regard heart rate and mean arterial blood pressure (MAB), figures 1and 2 showed non-significant difference between the 2 groups.

As regard patient's tolerance to endotracheal tube, group A showed a highly significant increase in numbers of patients in grade 0 and highly significant decrease in numbers in grades 1 and 2 in comparison with group B **(Table 3)**.

As regard nasal pack tolerance, group A showed better tolerance to nasal pack than group B **(Table 3)**.

As regard the amount of blood collected in the suction during surgery in group A was significantly higher than group B **(Table 3)**.

Time to 1st analgesic request was highly significant longer in group A than group B **(Table 3)**.

Total morphine dose given to patients in the 1st 24 hours postoperatively was significantly higher in group B than group A **(Table 3)**.

Table 1: Demographic characteristics of and time of operation

		Group A	Group B	Test	*p*- value
Age (years)		31.06 ± 10.1	31.4 ± 9.64	t = 0.13	0.9
Sex	♂	23 (76.7%)	24 (80%)	X^2 = 0.1	0.75
	♀	7 (23.3%)	6 (20%)		
Weight (Kg)		78.24 ± 12.08	80.01 ± 10.3	t = 0.61	0.54
ASA	**I**	18 (60%)	23 (76.7%)	X^2 = 1.9	0.16
	II	12 (40%)	7 (23.3%)		
Operative time (min.)		38.3 ± 6.05	41.1 ± 4.91	t = 1.97	0.054

Table 2: Type of operations

Nasal Surgery	Group A	Group B	X^2	*p*- value
Sinuscopy	12 (40%)	10 (33.3%)	0.29	0.86
Turbinectomy	11(36.7%)	12 (40%)		
Polypectomy	7 (23.3%)	8 (26.7%)		

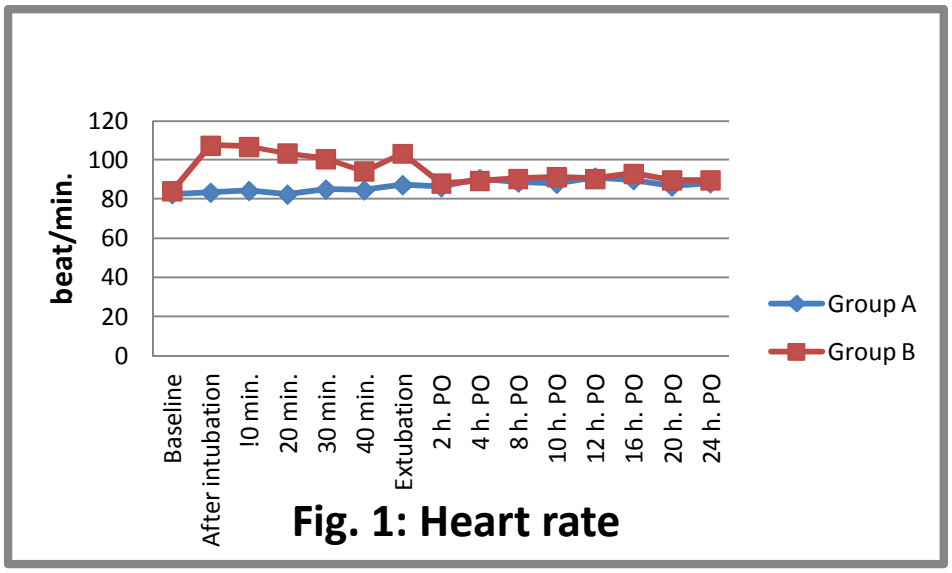

Fig. 1: Heart rate

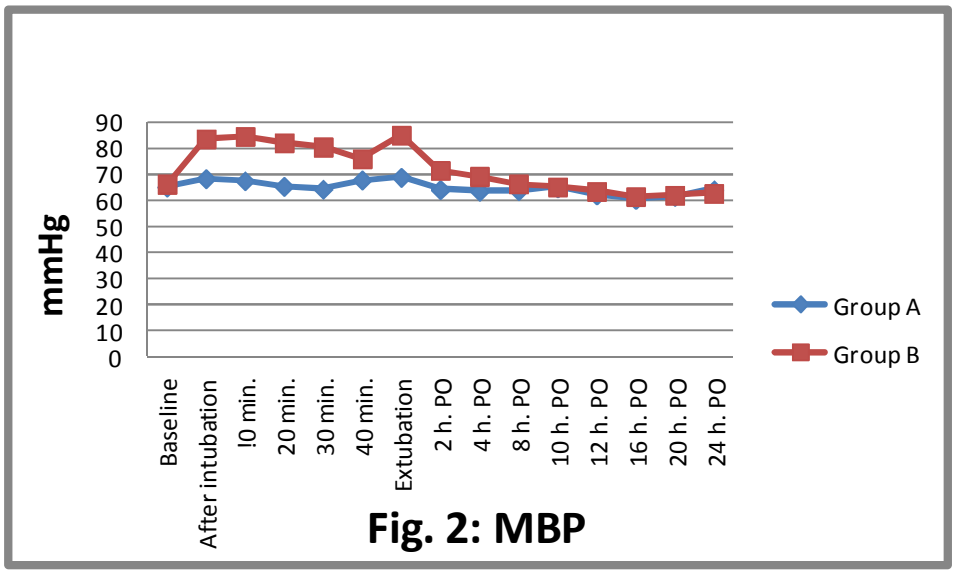

Fig. 2: MBP

Table 3: Tube tolerance, nasal pack tolerance, amount of Bleeding, 1st analgesic request and total Morphine consumption

		Group A	Group B	Test	*p*- value
Tube tolerance	Grade 0	22 (73.3%)	3 (10%)	Z = 4.98	< 0.01**
	Grade 1	8 (26.7%)	18 (60%)	Z = 2.6	< 0.01**
	Grade 2	0	9 (30%)	Z = 3.25	< 0.01**
Nasal pack tolerance	Grade 0	20 (66.7%)	6 (20%)	Z = 3.6	< 0.01**
	Grade 1	9 (30%)	20 (66.7%)	Z = 2.84	< 0.01**
	Grade 2	1 (3.3%)	4 (13.3%)	Z = 1.4	0.16
Bleeding (ml)		75.3 ± 10.8	70.2 ± 8.1	t = 2.06	0.04*
1st analgesicrequest (min.)		240.1 ± 25.5	90.6 ± 16.9	t = 26.8	< 0.01**
Total Morphine dose (mg)		4.89 ± 1.63	5.79 ± 2	t = 2.1	0.04*

4. Discussion

Laryngoscopy and endotracheal intubation provoke cardiovascular responses that include hypertension, tachycardia and dysrhythmias which result from sympathetic and adrenal stimulation. These responses are serious enough in normotensive patients and are more so pronounced in hypertensive patients[(11)].

Lignocaine has been used both topically and intravenously for the attenuation of the pressor response to laryngoscopy and intubation. The effect of topical lignocaine in attenuating the pressor response to laryngoscopy has been controversial. Lignocaine is absorbed following topical administration and its rate and extent of absorption being dependent upon concentration of total dose administered the specific site of action and duration of exposure[(12)].

It has been found that topical lignocaine sprayed before induction of anaesthesia to be more effective than lignocaine sprayed after induction of anaesthesia in attenuating the pressor responses [(13)].This was correlated with the present study which showed that preoperative lidocaine nebulizer reduces the pressor response to laryngoscopy and intubation.

Several studies showed that lidocaine spray is particularly effective in preventing the pressor response to tracheal intubation and preventing coughing during emergence [(14)]which correlates with the present study that tube and pack tolerance were significantly reduced in lidocaine nebulizer group in comparison with the control group.

The observed pain profile of lidocaine nebulizer that shows time to 1st analgesic request and total morphine dose were significantly reduced in lidocaine group in comparison to the controlgroup. This may be attributed to the pre-emptive timingof its administration. Several experimental studies demonstrated that various anti-nociceptive techniques applied before injuries are more effective in reducing the post injury central sensitization phenomena compared to administration after injury [(15)].

Kuo et al, have found that postoperative pain decreased in patients with Vaseline gauze pack after septoplasty prepared with lignocaine ointment compared to gauze pack alone [(16)]. And these results correlate with our findings that lidocaine nebulizer reduces postoperative pain and improved pack tolerance after nasal surgery.

Conclusion:

Lidocaine nebulizer attenuates the airway-circulatory reflexes and this seems to be from direct local anaesthesia rather than from systemic absorption from the airwayand this technique is simple effective way to suppress the cough and hyper dynamic reflex responses with minimal cost.

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11/12/2013