Effect of lidocaine injection into endotracheal tube on incidence of cough and laryngospasm

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Abstract
Aims: Coughing during anesthesia or after tracheal extubation is unwanted and can be harmful for patients undergoing cataract operation and causes damages to eye or finally blindness. The goal of this study was to determine the effect of lidocaine injection into endotracheal tube before extubation in decrease of incidence of cough and laryngospasm compared to normal method.

Methods: This is a double blind randomized clinical trial study performed for 6 months in Yasouj Imam-Sajjad Hospital on 66 above 18 year-old candidates of cataract operation. In test group 100 mg (5ml) of lidocaine 2% and in control group the same volume of placebo (normal saline) was injected into endotracheal tube. Using anesthesia drugs stopped 5 to 10 minutes before end of the surgery and after ending the operation extubation took place. The number of coughs and laryngospasm assessed, recorded and compared in three periods. Collected data was analyzed using SPSS 11 software.

Results: Systolic and diastolic blood pressure before operation, after extubation in operation room and in recovery room did not show a significant difference between control and test group. Number of coughs were higher in control group and the difference between 2 groups was significant.

Conclusion: Injection of lidocaine into endotracheal tube in patients under cataract operation reduces coughing after extubation.

Keywords: Lidocaine, Tracheal Extubation, Cough, Cataract

Introduction
Although intubation has been regarded very much especially when there is a problem in airways but extubation of patients has not been considered a lot. Anesthesia specialists know that the short time period after extubation is very harmful and causes several events such as laryngospasm, aspiration, lack of perfect opening of airways, lack of enough pulmonary rehabilitation and severe coughs could lead to hypoxemia, this problem can develop myocardial ischemia especially in patients suffering from coronary artery disease [1].

Cataract surgery is a common surgery among the elderly, which is usually performed under anesthesia. Anesthesia for eye surgery needs knowledge about pressure physiology of the eye, eye anatomy and effects of anesthesia drugs on it. Regarding this fact that patients usually are potential for eye surgery at old age or childhood, special considerations are needed for anesthesia in these patients. Factors that possibly increase the eye pressure during anesthesia are increase in blood pressure, laryngoscopy, intubation, vomiting and coughing. Since unexpected movements of patients and their eyes during delicate eye surgery causes increase in eye pressure, bleeding, pulling out fovea materials and blindness it is very important to prevent cough and sudden movements of patients, aware patients slowly and prevent laryngospasm during extubation after eye surgery [2]. Cough is a problem that occurs during extubation and causes sudden increase of body pressures. This problem is very harmful for patients with eye injury (corneal split) or high intracranial pressure [1]. Reflex activity of airways decreases with aging. Decrease in airway activity also happens during anesthesia and receiving recovery drugs and it is clearer among young people. This decrease in sensitivity of airway reflexes is very important in old people because its result can be the increase in aspiration danger [3]. Four urgent drugs including epinephrine, lidocaine, naloxan and atropine are injected into tracheal tube and are absorbed from endotracheal membrane because of its abundant vessels [4, 5, 6, 7]. The aim of this study was to determine the effect of lidocaine injection into endotracheal tube on the rate of cough and laryngospasm after extubation in cataract surgery.

Methods
This is a double blind randomized clinical trial study. The study was performed for 6 months in Yasouj Imam-Sajjad hospital on 66 above 18 years old candidates of cataract operation in year 1384 that were
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in physical state of 1 and 2 (according to classification of American Society of Anesthesia). After description of research issue and obtaining patients’ satisfaction, participants were divided into two, test and control groups by randomized division into four person blocks. The sample size regarding the research type and its main goal and with consideration of \( \alpha=5\% \) and \( \beta=60\% \) and maximum error of \( d=0.01 \) also \( p_l=0.175 \) and \( p_2=0.05 \) was evaluated 30 people for each group. Patients who had a problem during intubation or their physical state was more than 3 according to the classification of American Society of Anesthesia or encountered an unexpected event such as arrhythmia, bleeding or increase of operation time more than one hour were excluded. An expert person did intubation of two groups after performing anesthesia with midzolam (0.05 mg per kg body weight), phentanile (2 \( \mu \)g per one kg body weight), nesdonal (4 mg per one kg body weight). Then the patients were connected to a ventilator and anesthesia continued with Mac (Minimal Alveolar Concentration) 0.8 halotan, oxygen and nitroxide four liters per minute. A dry gas was put at the end of patients’ pharynx in order to decrease the need for excretions suction. Between patients of control group 100 mg (equal to 5 cc) of lidocaine and in control group equal volume of normal saline was spilled into tracheal tube and the operation was done. Halutan stopped for 5 to 10 minutes before operation ending, and after operation, the return was done. Patients were extubated when they were able to open their eyes in reply to verbal orders. Then the patient’s cough numbers in three states (without cough, moderate cough, including one to five coughs and severe cough, including more than five cough) and laryngospasm was considered and registered by another person who didn’t have any knowledge about control and test group. These evidences were measured three times, after extubation at surgery room, at entrance time to recovery room and at exiting time from recovery. Then these changes were measured between the two control and test groups. Data was analyzed using central statistical indices, distribution, and student t-test by SPSS 11 software.

Results

The mean and standard deviation of the patients in this study was 65.4 and 12.8 respectively, minimum age was 25 years, and maximum age was 104 years. Systolic and diastolic blood pressure changes before operation, after extubation and at recovery room did not have significant difference in control and test groups. In addition, pulse rate changes and blood oxygen rate at different stages of surgery did not have significant difference in two control and test groups. However, cough number had significant difference between two groups after extubation so that in test group nine patients, and in control group 23 patients had more than two cases of moderate and severe coughs (table 1). In other words, the cough decreased from 66.6 percent in control group to 27.7 percent in test group. Laryngospasm incidence cases in test group were one patient and in control group was two patients that was not significant.

### Table 1 - Distribution of cough rate at different degrees between test and control groups

<table>
<thead>
<tr>
<th>State→</th>
<th>Without cough</th>
<th>Moderate cough</th>
<th>Severe cough</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>24(73%)</td>
<td>7(21%)</td>
<td>2(6%)</td>
<td>33(100%)</td>
</tr>
<tr>
<td>Control</td>
<td>10(30%)</td>
<td>18(54%)</td>
<td>5(15%)</td>
<td>33(100%)</td>
</tr>
<tr>
<td>Sum</td>
<td>34(52%)</td>
<td>25(21%)</td>
<td>7(11%)</td>
<td>66(100%)</td>
</tr>
</tbody>
</table>

Regarding the significant decrease of cough incidence in patients who had received lidocaine by tracheal tube, we expected that the hemodynamic changes in this group would be less too but our study didn’t show this fact. This is probably arising from lack of accuracy of the blood pressure measuring systems (manual type) and old pulse oxymetry system. Therefore, we recommend using accurate and digital systems for evaluating hemodynamic changes at future studies.

### Table 2 - Distribution of laryngospasm between control and test group

<table>
<thead>
<tr>
<th>State→</th>
<th>Without laryngospasm</th>
<th>With laryngospasm</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>1(3%)</td>
<td>32(97%)</td>
<td>33(100%)</td>
</tr>
<tr>
<td>Control</td>
<td>2(6%)</td>
<td>31(94%)</td>
<td>33(100%)</td>
</tr>
<tr>
<td>Sum</td>
<td>3(4.5%)</td>
<td>63(95.5%)</td>
<td>66(100%)</td>
</tr>
</tbody>
</table>

Discussion & Conclusion

In this study, we saw the decrease of cough number at extubation time after lidocaine injection into endotracheal tube. In Sasaki and Koc studies on decrease of cough rate after extubation, intravenous injection of narcotic drugs such as phentanil or lidocaine injection had been more effective before extubation. Also in Bidwaski and Stanely study it was distinct that laryngospasm (severe and long reaction to laryngeal closure reflex) decreases in patients who received 2% lidocaine locally in larynx region and above it, the same as patients who received intravenous lidocaine with the difference that
anesthesia and sleeping time does not increase in this state [9].

Staffel and Weissler at 1991 showed that using 4% lidocaine spray on tonsilar region decreases the need for anesthetic drugs and arrhythmia and laryngospasm after tonsil surgery [10].

Gawronski showed in his study that endotracheal injection of lidocaine in tonsil operations decreases cough from 17.5% to 5% but because the volume and dose of the injected drug was not enough, this decrease was lower than the expected amount [11].

Unlike intravenous injection of lidocaine as the study of Anderson et al. [12], intra tube injection of lidocaine does not cause increase in dizziness and anesthesia time. In this study lidocaine injection into endotracheal tube caused decreased cough rate from 66.6 to 27.7% that is concordant to similar studies. Cough among patients of this study was more than Gawronski et al. study but we could not interpret this event.

Age range of patients in this study was higher than Gawronski, because tonsillectomy is usually done at childhood and cataract surgery is done in old age. Regarding the fact that the activity and airway reflexes decreases with increase of age [11], we expected a high rate of cough decrease in patients of our study but this was not true. Occurrence of only three cases of laryngospasm among all cases was similar to Anderson study and showed the decrease of this problem in elderly [12].

Bidway and Stanly considered effects of lidocaine on blood pressure and heart rate in reply to extubation. They spilled 1.5 cc of lidocaine into tracheal tube 3 to 5 minutes before extubation and they spilled the second dose of 4% lidocaine (1cc) during extubation. They reported no increase in blood pressure and heart rate during 1 to 5 minutes after extubation.

In Gawronski study in year 2003 using lidocaine by filling tracks of tracheal tube with it was more effective than other methods such as smearing the tip of tracheal tube or spraying to the end of tracheal tube. In this study the value of intravenous injection was reported the same as the value of filling the tracks of tracheal tube with lidocaine [11].

Richard showed that lidocaine injection into endotracheal tube blocks airway receptors and consequently inhibits of cough [13]. Present study has also shown this fact. Bidwaski [9] has reported that in this method the changes of cardiovascular indices are minimal. We did not see these changes possibly because our system was not accurate and they were old. Therefore, measurement systems should be considered in future studies. Lidocaine injection into endotracheal tube before extubation is recommended for patients who cough occurrence is dangerous for them, such as patients under eye surgery or craniotomy or procedures in which cough occurrence interferes, such as bronchoscopy or patients whose surgery is not possible with tracheal tube, but they have indications for intubation. In addition, one of the other cases for intolerance of tracheal tube is during transferring patients to the wards or between hospitals. In such cases lidocaine injection into endotracheal tube, increases tracheal tube tolerance in patients.

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References