Comparison of ondansetron, metoclopramide, hyoscine and dexamethasone for prevention of post-operative vomiting in cataract surgery

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Abstract

Introduction:
Postoperative nausea and vomiting (PONV) complicates the lives of patients. Most of antiemetic drugs used prevent PONV after surgery, but they have undesirable adverse effects such as excessive sedation, hypotension, dysphoria and extrapyramidal symptoms. This study aimed to find out the best drugs for the above-mentioned problem.

Materials and Methods:
In a prospective double blinded trial, 250 patients with ASA class I, II undergoing general anesthesia for cataract surgery were assigned randomly in five groups. Before the induction of anesthesia, the patients received Metoclopramide, Dexamethasone, Hyoscine, or Ondansetron and placebo randomly. Vomiting episodes were recorded during 24 hours after the surgery.

Results:
The incidence of vomiting was 10% for Dexamethasone, 8% for Metoclopramide, 6% for Ondansetron, 12.3% for Hyoscine, and 27.2% for placebo groups.

Conclusion:
The incidence of vomiting after cataract surgery showed a significant difference among the five drugs. Ondansetron was the most effective drug for prevention of post-operative vomiting. Of course, other drugs can be used in this operation as well.

Keywords: Ondansetron, Dexamethasone, Metoclopramide, Hyoscine, Scopolamine, Placebos

Introduction
Nausea is an unpleasant feeling associated with the urge to vomit. This sensation is often felt in the upper abdomen and in the posterior pharynx and is associated with the loss of the natural pressuring and stretching of the abdominal muscles. This sensation is also associated with contractions of the beginning of intestine and the backflow of intestinal content into the stomach. Certain symptoms related to the autonomic system could also occur including the feeling of extreme fatigue, pallor, hypersalivation, blood pressure drop and elevated heart rate (1). Vomiting is a common postoperative complication that is unpleasant for patients. The incidence rate of this complication after surgeries performed with general anesthesia is higher than surgeries performed with local anesthesia (2). The vomiting center is responsible for coordinating messages transmitted to the abdominal muscles via vagal afferent nerves, phrenic nerves and also intervertebral nerves when vomiting occurs (3). Several studies conducted in recent years have shown that the incidence...
of postoperative vomiting is approximately 20%-72% in adults and 13%-32% in children (4, 5), though only 1%-3% of the cases are highly severe and uncontrollable (3).

Similar studies have reported the incidence of this complication to be about 65% in cases where no preventive medication has been administered (6, 7). The main reason for the incidence of nausea and vomiting and the process whereby it occurs are not exactly determined yet, but several factors seem to be involved in its incidence including the patient’s demographic characteristics such as age, gender and race, type of surgery performed, anesthetic technique used and type of medication used to induce and sustain anesthesia (3). For example, in terms of gender, this complication has been reported to occur two to four times more in women than in men (8). The patient-specific characteristics are factors that cannot be controlled by the anesthetist. In other words, children experience more postoperative nausea and vomiting than adults (3). Obesity and a history of motion sickness are also predisposing factors for postoperative nausea and vomiting (9).

The incidence of vomiting has been reported to be higher in abdominal surgeries, female genital surgeries, laparoscopic surgeries, ear surgeries and eye surgeries (10). Nausea and vomiting may prepare the way for other complications such as wound dehiscence, aspiration of gastric contents or bleeding at the site of surgery. Delayed oral feeding, delayed patient discharge from the hospital and more care required during the hospital stay are also among the consequences of postoperative vomiting (8).

Performing the surgery during the menstrual cycle increases the risk of postoperative vomiting four-fold of the normal condition. The probability of postoperative vomiting is also high during pregnancy due to the hormonal changes (11). Medications administered for sedation, eliminating anxiety and reducing airway secretions decrease the incidence of postoperative nausea and vomiting perhaps through decreasing the gastric contents or increasing gastric pH (11). Compared to general anesthesia, local anesthesia is associated with a lower incidence of postoperative nausea and vomiting. Nausea and vomiting may occur even after simple local blocks of the lower limbs. Vomiting induced by local anesthesia occurs more frequently during surgery. Strong inhaled medications are associated with a lower incidence of postoperative vomiting compared to ether and cyclopropane (11). Anticholinergic drugs such as neostigmine can increase the incidence of postoperative vomiting by reducing gastric emptying (11). Pain prolongs the gastric emptying duration and thus causes postoperative nausea and vomiting. Patient controlled analgesia and the use of neuraxial opioids and epidural analgesia after the surgery improve the quality of postoperative pain; however, it is essential to note that the use of opioids might itself be a risk factor for postoperative nausea and vomiting. Opioid-induced vomiting can be reduced by changing the type of opioid used (5).

Gastric distension is usually associated with increased postoperative vomiting. As proved by one study, patients ventilated by inexperienced people prior to intubation experience higher levels of postoperative vomiting compared to those who were ventilated by skilled personnel; however, emptying of the stomach by oral gastric suction through the mouth either has no effect on postoperative vomiting or else increases it (3). Cataract is a common eye disease whose prevalence increases with age. The prevalence of cataract is 50% in people aged 65 to 74 and about 70% in people over the age of 75 (12). Three major issues with cataract anesthesia are the probability of malignant hyperthermia increase, the high prevalence of postoperative vomiting and the risk of developing oculocardiac reflex. The incidence of post eye surgery vomiting has
been reported to be 48%-85%. Persistent vomiting after eye surgery leads to delayed patient discharge from the hospital (12). The highest prevalence of postoperative vomiting pertains to strabismus surgeries. Extraocular muscle traction stimulates ocular reflex afferent pathway –thus causing vomiting. Postoperative vomiting is more prevalent in adults and in young girls. Ophthalmologists previously believed that the sudden shift in the visual axis is responsible for this type of postoperative vomiting. However, covering an eye after surgery does not affect the incidence of postoperative nausea and vomiting in this surgery. In general, ocular surgeries demanding extensive ocular manipulation pose a high risk of vomiting. Prophylactic use of antiemetic medications can block the visual pathway responsible for vomiting and thus prevent vomiting (12). Given the complications mentioned, the present study investigates four types of medication effective in the prevention of postoperative nausea and vomiting and their degree of effectiveness for patients.

Materials and methods
After obtaining the necessary permissions from the Research Council and Ethics Committee of Jahrom University of Medical Sciences, this study was conducted on 250 patients undergoing cataract surgery in a prospective, randomized, double-blind trial. Patients having attended Shahid Motahari Hospital in Jahrom in 2010-2011 with an American Score of Anesthesia (ASA) of 1 or 2 were randomly selected and assigned into five groups of 50 each. All the necessary information was provided to the patients and their written consent to participate in the study was obtained. However, the patients could withdraw from cooperation and participation in the research at any time they wished to. Patients with gastrointestinal diseases, a history of taking anti-nausea medications in the 24 hours preceding surgery, involuntary movement disorder, chronic obstructive pulmonary disease, previous partial gastrectomy, menstruation and a history of smoking were excluded from the study.

Patients were allowed to drink a little water up to three hours before the surgery; however, eating solid food was forbidden for at least eight hours before surgery. As a premedication, midazolam administered at the dose of 0.01-0.02 mg per each kg of body weight; the method of inducing anesthesia was similar for all the patients and included fentanyl and atracurium as relaxant thiopentals injected intravenously. After inserting the sealed laryngeal mask, an anesthesiologist performed the anesthesia using propofol in a mixture of 50% N2O and 50% O2. Intravenous fluids were administered during surgery based on the patient’s needs and according to the standard procedures. The patients’ breathing during surgery was controlled by a skilled personnel. All the patients selected for the present study were randomly divided into five equal groups including group one with 5 mg metoclopramide, group two with 20 mg hyoscine, group three with 8 mg dexamethasone, group four with 2 mg ondansetron and group five with placebo. In each group, one of the proposed medications was injected intravenously for the prevention of nausea and vomiting prior to inducing anesthesia. Nobody knew about the content of the syringes except for the nurse who prepared them.

Subsequently, nursing care was provided for each patient in the recovery room for an hour and the incidence and frequency of vomiting were recorded for each group. If a patient vomited more than twice in the recovery room, he would receive an intravenous injection of metoclopramide or ondansetron and would then be excluded from the study. In the next 24 hours of the surgery, the frequency of
vomiting in the patients was recorded by the staff at the ocular surgery department and the questionnaire was filled out. The responsible staff did not know the type of medication given to the patients prior to surgery. Data were collected and entered into the computer and analyzed by SPSS software using Chi-square tests. P<0.05 was considered statistically significant in the present study.

Results
The total number of patients was 250, who were divided into five groups of 50 each. Patients were in the age range of 32 to 93 and no significant difference was observed among the different groups. The patients in the five groups matched in terms of gender. The greatest number of men belonged to the metoclopramid group and the smallest number to the hyoscine group. Most women belonged to the control, ondansetron and metoclopramide groups in equal numbers and least belonged to the hyoscine group. Within the 24 hours after surgery, 92% of the patients in the first group, 87.8% of the second group, 90% of the third group, 94% of the fourth group and 72.7% of the fifth group did not vomit. In addition, 6% of the patients in the first group, 8.2% of the second group, 8% of the third group, 2% of the fourth group and 23.6% of the fifth group had vomited only once.

During this period, 2% of the patients in the first group, 4.1% of the second group, 2% of the third group, 4% of the fourth group and 3.6% of the fifth group had vomited twice. All the cases were statistically significant (P=0.027) (Table 1).

<table>
<thead>
<tr>
<th>The type of drug injected</th>
<th>The observed percentage of vomiting</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>Once</td>
</tr>
<tr>
<td>Metoclopramide</td>
<td>92</td>
<td>6</td>
</tr>
<tr>
<td>Dexamethasone</td>
<td>87.8</td>
<td>8.2</td>
</tr>
<tr>
<td>Hyoscine</td>
<td>90</td>
<td>8</td>
</tr>
<tr>
<td>Ondansetron</td>
<td>94</td>
<td>2</td>
</tr>
<tr>
<td>Placebo</td>
<td>72.7</td>
<td>23.6</td>
</tr>
</tbody>
</table>

The highest prevalence of one time vomiting was observed in the control group and the lowest in the ondansetron group. In addition, the highest prevalence of two times vomiting was observed in the control, ondansetron and hyoscine groups in equal numbers and the lowest in the metoclopramide and dexamethasone groups (Figure 1).

Neither of the patients in any of the five groups experienced apnea or a decrease in arterial oxygen saturation or laryngospasm in the recovery room. In addition, during the stay in the recovery room, no involuntary movements indicating the incidence of extrapyramidal complications were observed in any patients in the three groups.
Discussion

Reviewing results of the present study showed that the intravenous use of metoclopramide, dexamethasone, hyoscine and ondansetron as antiemetics before undergoing cataract surgery can significantly reduce the incidence of this unpleasant complication; in fact, the prevalence of this complication in the first 24 hours after surgery was 8% in the metoclopramide group, 10% in the dexamethasone group, 12.3% in the hyoscine group, 6% in the ondansetron group and 27.2% in the placebo group. The prevalence of this complication varied significantly among the groups.

The present study is evidence that taking any of the drugs metoclopramide, dexamethasone, hyoscine and ondansetron is effective for reducing postoperative vomiting. Ondansetron proved superior to the other drugs studied. It thus seems that ondansetron is the most effective drug in reducing postoperative nausea and vomiting while hyoscine is the least effective. This case could be due to the central effect of ondansetron on the central nervous system. In 2008, Dr. Nidhi Bhatia conducted a study in which he compared the effect of the drugs granisetron, ondansetron, metoclopramid and placebo on patients under gynecological laparoscopic surgery and concluded that granisetron prevents the incidence of postoperative vomiting better than ondansetron and the latter better than metoclopramid. This finding is consistent with results of the present study (13).

In 1997, Bach Styles conducted a study to compare the effects of ondansetron, metoclopramide and placebo on preventing nausea and vomiting in patients undergoing ocular surgery and concluded that ondansetron is the most effective antiemetic. In this study, 94% of patients who received ondansetron did not vomit at all. The findings of this study are also consistent with results of the present study (14). The drugs used in the present study can help choose the most effective drug for the prevention of nausea and vomiting in patients requiring cataract surgery.

In a study conducted in 2006 by Zesowski et al. for measuring the anti-nausea and vomiting effect of ondansetron, metoclopramide and dexamethasone on patients undergoing cholecystectomy, it was determined that ondansetron and dexamethasone are more effective than metoclopramide in preventing nausea and
vomiting (15). The better effect of ondansetron on preventing nausea and vomiting suggested by this study has also been confirmed by the present study; however, the effect of metoclopramide and dexamethasone varies from the effect found by the present study, which is probably due to the difference in types of surgery. In another study conducted by Zesowski et al. in 2003 on the anti-vomiting effect of ondansetron, metoclopramide and dexamethasone in patients undergoing tonsillectomy, it was determined that ondansetron is the most effective drug in the prevention of nausea and vomiting and dexamethasone the least effective one (16). Results of this study are perfectly consistent with results of the present study. The difference between the results of this study with results of the study conducted by the same researcher only three years later is perhaps due to the difference in types of surgery as well as the duration of general anesthesia.

**Conclusion**

Analysis of results of the present study and a brief review of other studies conducted on this topic allow to suggest that using any of the drugs metoclopramide, dexamethasone, ondansetron and hyoscine prior to cataract surgery can effectively reduce the incidence of postoperative vomiting; however, none of these drugs is able to eliminate the incidence of nausea and vomiting to zero and it is probably the case that each one of them is more effective than the others for a specific surgery.

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**Conflicts of Interest**

The authors declare no conflicts of interest in this study.

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**References:**