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ORIGINAL ARTICLE

# The additional effect of granisteron over propofol and sevoflurane on prophylaxis of vomiting after pediatric adenotonsillectomy

**Ibrahim Rezk [a], Ahmad Abdelmabood [b], Waleed A.M. Abdelhameed [a,*]**

[a] *ENT Department, Sohag Faculty of Medicine, Sohag University, Egypt*
[b] *Anaesthesia and Intensive Care Department, Sohag Faculty of Medicine, Sohag University, Egypt*

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**KEYWORDS**

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**Abstract** *Introduction:* Postoperative vomiting (POV) after adenotonsillectomy in children is a common problem with an incidence as high as 40–80%. Only few studies in the literature compared the effect of different anesthetic techniques concerning postoperative vomiting in children.

*Objectives:* To compare the effect of granisteron over propofol and sevoflurane in prevention of POV after adenotonsillectomy in children.

*Patients and methods:* This cohort, double blind study included 80 children with age between 4 and 12 years, undergoing tonsillectomy ± adenoidectomy, they were divided into 4 equal groups, in groups (I, II) the induction and maintenance of anesthesia were done by propofol, granisteron was given 5 min before extubation to group II. In groups (III, IV) induction and maintenance were done by sevoflurane, granisteron was given 5 min before extubation to group IV.

*Results:* The incidence of vomiting 24 h after surgery was 30% among all patients, with lower incidence in groups I and II than groups III and IV. Groups II and IV had the lowest incidence of postoperative vomiting

*Conclusions:* On performing adenotonsillectomy in children, the incidence of postoperative vomiting is lower with (i.v. anesthetics) propofol than (volatile anesthetics) sevoflurane. Use of granisteron significantly reduces the incidence of postoperative vomiting in children undergoing this procedure.



* Corresponding author. Address: ENT Department, Sohag Faculty of Medicine, Sohag University, Sohag 82524, Egypt. Tel.: +20 01112552045; fax: +20 0932310885.
E-mail address: Waleed88882001@yahoo.co.uk (W.A.M. Abdelhameed).

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## 1. Introduction

Postoperative vomiting is a commonly observed and adverse event after tonsillectomy with or without adenoidectomy in children.[1] The incidence of postoperative nausea and vomiting (PONV) following pediatric adenotonsillectomy is 40–80% which is higher than strabismus surgery.[2]

Related factors that affect the incidence of PONV include premedication, intraoperative anesthetic methods and drugs, and postoperative factors such as pain management and timing of oral intake.[3]

Volatile anesthetics were the leading cause of early PONV. Compared with isoflurane, total intravenous anesthesia with propofol and remifentanil resulted in a significantly lower incidence of PONV.[4]

Granisteron is a selective 5-hydroxytryptamine type 3 ($5HT_3$) receptor antagonist and is effective for the treatment of emesis in patients receiving cytotoxic drugs.[5]

According to The Scottish Intercollegiate Guidelines Network published in 2010, a single intraoperative dose of dexamethasone (dose 0.15–1.0 mg/kg) is recommended to prevent PONV in children undergoing tonsillectomy or adenotonsillectomy.[6]

The reported incidence of vomiting after tonsillectomy with or without adenoidectomy in children varies from 62% to 73% when no prophylactic antiemetic is given, this incidence justifies the use of prophylactic antiemetic after pediatric tonsillectomy.[1]

### 1.1. Objectives

Are to compare the effect of granisteron over propofol and sevoflurane in prevention of postoperative vomiting after adenotonsillectomy in children.

## 2. Patients and methods

After approval of our ethics committee at Sohag Faculty of Medicine and informed parental consent, we had done this cohort, double blind study on eighty children from January to December 2011 at the ENT department, they were classified according to American Society of Anesthesiologists (ASA) as physical status , aged 4–12 years, they underwent tonsillectomy with and without adenoidectomy. The children were allocated randomly and subdivided into four equal groups:

*Group I:* Induction had been done by propofol 2 mg/kg, endotracheal intubation was facilitated by *cis*-atracurium 0.15 mg/kg, anesthesia was maintained by propofol 9 mg/kg. *Group II:* Induction technique was the same as group I, with addition of granisteron 0.04 mg/kg 5 min before extubation.

*Group III:* Induction had been done by sevoflurane 8%, endotracheal intubation was facilitated by *cis*-atracurium 0.15 mg/kg, anesthesia was maintained by sevoflurane 2–3%. *Group IV:* Induction technique was done as in group III, with addition of granisteron 0.04 mg/kg 5 min before extubation.

Tonsillectomy was performed by the cold knife technique with bipolar electrocautery and ties for hemostasis, and adenoidectomy by the conventional curettage technique. All children were monitored for POV 24 h after surgery. Prior to the surgery children were not given solids for 6 h and clear fluids for 3 h, no steroids or analgesics were given to children pre, intra or postoperatively.

Exclusion criteria: children less than 4 years, obese children with ASA II as obesity can increase incidence of PV, those who received steroids or antiemetics before surgery, also children with a history of allergy to studied drugs.

### 2.1. Statistical method

Using SPSS.16 software, statistical analysis between treatment groups was performed by Paired $T$ test, $P$ value less than 0.05 was considered significant.

## 3. Results

This study included 80 patients (42 females and 38 males), they were comparable with respect to patient demographics and type of surgery (Table 1). The incidence of vomiting 24 h after surgery was 30% among all patients, with lower incidence in groups I and II than groups III and IV, these data are shown in Fig. 1. Using paired $T$ test, there was a significant decrease in POV in group II vs. I ($P = 0.048$), groups IV vs. III ($P = 0.027$), while the decrease in POV between groups I vs. III ($P = 0.454$) and groups II vs. IV ($P = 0.434$) did not reach the statistical significance.

## 4. Discussion

In our study, the incidence of POV in the post anesthesia care unit (PACU) was lower in the groups that received propofol (25%) than those who received sevoflurane (35%).

**Table 1** Demographic characteristics of patients.

| Characters | Groups | | | |
|---|---|---|---|---|
| | Group I propofol alone | Group II propofol + granisteron | Group III sevoflurane alone | Group IV sevoflurane + granisteron |
| *Sex n (%)* | | | | |
| Males | 10 (50%) | 9 (45%) | 11 (55%) | 8 (40%) |
| Females | 10 (50%) | 11 (55%) | 9 (45%) | 12 (60%) |
| Age (years) Mean ± SD | 9.25 ± 2.92 | 8.1 ± 2.63 | 7.9 ± 2.73 | 8.35 ± 3.22 |
| Weight (kg) Mean ± SD | 23 ± 11 | 22 ± 13 | 24 ± 12 | 23 ± 11 |
| *Procedure N (%)* | | | | |
| Tonsillectomy | 16 (80%) | 16 (80%) | 13 (65%) | 16 (80%) |
| Adenotonsillectomy | 4 (20%) | 4 (20%) | 7 (35%) | 4 (20%) |

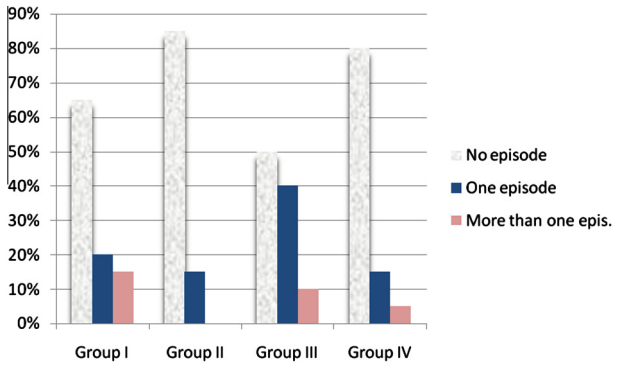


**Fig. 1** Incidence of postoperative vomiting in the four groups.

However no differences in this incidence were found after discharge from PACU.

Kranke et al. showed that anesthesia induction with propofol was associated with a lower incidence of PONV compared to induction with volatile anesthetic, Halothane, which was used for maintenance during tonsillectomy in children.[7]

Imurina et al. compared four types of anesthetic induction and maintenance techniques using nitrous oxide with sevoflurane and/or propofol regarding PONV after adenotonsillectomy. They showed that PONV occurred 3.5 times more often among children who received volatile anesthetic sevoflurane and nitrous oxide compared to children who received propofol during anesthesia maintenance.[8]

Sevoflurane is a well tolerated inhalation induction agent in all age groups, because it has pleasant smelling and is relatively non irritant to the airways.[9]

Due to the low blood and tissue solubilities and cardiopulmonary stability, it is a suitable anesthetic for ambulatory surgery in infants and children.[10,11]

Propofol prevents PONV by playing a role in blocking 5-HT3 receptors or by directly inhibiting not only the chemoreceptor trigger zone in the CNS but also the vagus nerve, which is associated with nausea and vomiting.[12]

In this study the use of granisteron significantly reduced the incidence of POV, where the incidence of POV was 42.5% in groups that had not received granisteron, compared to only 17.5% in the groups who received a dose of 40 μg/kg.

Jokela et al. have demonstrated antiemetic efficiency of granisteron in reducing PONV in patients undergoing ENT surgery.[13]

Fujii et al. have demonstrated that antiemetic efficiency of granisteron 40 μg/kg is superior to granisteron 20 μg/kg. In 1998, they demonstrated that granisteron is highly effective in reducing the PONV in patients undergoing middle ear surgery, also the efficiency of granisteron 40 μg/kg was similar to 100 μg/kg to prevent PONV.[14] The dose (40 μg/kg) chosen for this study is considered as optimal dose to prevent POV.

In a randomized, double- blind dose-ranging study involving 80 pediatric patients (mean age 10.3 years) scheduled to receive highly emetogenic chemotherapy, i.v. granisteron, 10, 20, or 40 μg/kg was effective over 24 h at preventing nausea and vomiting. There were no significant differences in efficacies between doses, though a trend toward better control in the 40 μg/kg dose group was observed.[15,16]

Many studies have documented the efficacy and safety of both intravenous and oral granisteron in the prevention of postoperative nausea in children, including the use of granisteron in children undergoing strabismus surgery or tonsillectomy.[8,17,18]

### *4.1. Limitations*

- This work is done over small number of patients, needs to test efficacy of granisteron over a larger group.
- Further work is needed to compare antiemetic effect of granisteron over other medications e.g. steroids.

## 5. Conclusions

- Use of granisteron significantly reduces the incidence of POV in children undergoing adenotonsillectomy.

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## Conflict of interest

None.

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