Singapore Med J 1999; Vol 40(3):144-146

Postoperative Vomiting (POV) in the Paediatric Outpatient General Surgical Population

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ABSTRACT

Aim: To determine the incidence of postoperative vomiting (POV) in the paediatric outpatient general surgical population, the factors affecting POV and the incidence of unplanned admissions contributed by POV.

Method: One hundred and ninety-nine children below 13 years of age undergoing elective outpatient general surgical procedures were enrolled into this prospective study. Anaesthesia was induced either intravenously or via the inhalational route. It was then maintained with nitrous oxide, oxygen and isoflurane or halothane. The age, sex, body weight, duration of fasting, administration of trimeprazine, type of general surgical procedure, maintenance technique for general anaesthesia, duration of general anaesthesia, the administration of opiods or local anaesthetics and the incidence of POV were noted. The results were analysed initially with chi-squared test and subsequently subjected to multivariate logistic regression analysis and stepwise variable selection method.

Results: The incidence of POV was 8.5%. Duration of general anaesthesia greater than one hour was associated with a significantly higher incidence of POV. Postoperative emesis did not contribute to unplanned admissions in these day surgical patients.

Keywords: vomiting, postoperative, paediatric outpatient general surgical population

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INTRODUCTION

Postoperative vomiting (POV) may be distressing in the recovery period for the paediatric patient, the parents and the care-givers. In addition, it may result in metabolic disturbances, increased risk of aspiration, wound dehiscence, increased costs for the patient and the hospital and an aversion to further surgery. The reported incidence of POV in children varies widely, ranging from 7.3%[1] to 85%[2]. As there is no previous local data available, this study aims to determine the incidence of POV in the local paediatric outpatient general surgical population, the factors affecting POV and the incidence of unplanned admissions contributed by POV.

METHOD

Over a two-month period, all children (American Society of Anesthesiologists physical status I – II) less than 13 years of age undergoing elective outpatient general surgical procedures were admitted into our study. Children undergoing ear, nose and throat (ENT), dental and strabismus correction procedures were excluded. All anaesthetists participating in the study either omitted premedication or prescribed trimeprazine premedication and used anaesthetic techniques of their choice. Anaesthesia was induced intravenously with thiopentone in 152 children (76.4%) and via the inhalational route with halothane in 47 children (23.6%). Anaesthesia was then maintained with nitrous oxide, oxygen and isoflurane or halothane.

Anaesthetists, recovery nurses and ward nurses were asked to complete a questionnaire. This comprised 3 parts. Part I was completed by the anaesthetists and included information on the age, sex and body weight of the patient, duration of fasting, administration of trimeprazine premedication, type of general surgical procedure, maintenance technique for general anaesthesia, administration of opioids or local anaesthetics, duration of general anaesthesia, incidence of vomiting at termination of the general anaesthesia and the administration of prophylactic antiemetics.

Part II of the questionnaire was completed by nurses in the recovery room and detailed occurrence of POV and the use of antiemetics. The rescue antiemetic was given at the discretion of the individual anaesthetist.

The last part of the questionnaire was completed by nurses in the ward and contained information pertaining to the use of opioids in the postoperative period, the occurrence of vomiting and the rescue antiemetic employed. The number of patients who required admission as a result of POV was also noted. The incidence of POV after discharge was not ascertained in this study.

Vomiting was defined as forceful expulsion of gastric contents. Nausea, a subjective feeling of the urge to vomit, was not surveyed in this study due to the difficulty in evaluating this symptom in children.

METHODS

The results were analysed initially with chi-squared test and subsequently subjected to multivariate logistic regression analysis and stepwise variable selection method. Age, sex, duration of fasting, administration of trimeprazine premedication, type of general surgical procedure, maintenance technique for general anaesthesia, duration of general anaesthesia and the administration of opioids or local anaesthetics were investigated for inclusion into the model.

Table I – Patient and surgical factors in POV versus percentage of children who vomited (n = 199)

Factor	Number	Number who vomited	% who vomited
Age			
2 months – < 6 years	113	6	5.3
6 – < 13 years	86	11	12.6
Gender			
Male	169	14	8.3
Female	30	3	10.0
Surgical Procedure			
Circumcision	81	4	4.9
Herniotomy	67	7	10.4
Others*	51	6	11.8

* Include orchidopexy, incision and drainage of lip and neck abscesses, ligation of tongue tie, excision of skin tags, sebaceous cysts, lymph nodes and laser haemangioma

Table II – Anaesthetic factors in POV versus percentage of children who vomited (n = 199)

Factor	Number	Number who vomited	% who vomited
Duration of fasting (hours)			
< 6	46	4	8.7
⩾ 6	153	13	8.5
Premedication			
Nil	149	17	11.4
Trimeprazine	50	0	0*
Maintenance technique for general anaesthesia			
Intermittent positive pressure ventilation	14	3	21.4
Spontaneous respiration	185	14	7.6
– Face mask	159	12	7.5
– Laryngeal mask airway	26	2	7.7
Duration of general anaesthesia (hours)			
⩽ 1	193	15	7.8
> 1	6	2	33.3**
Analgesics			
Opioid			
– Used	21	3	14.3
– Not used	178	14	7.9
Local Anaesthetics			
– Used	181	14	7.7
– Not used	18	3	16.7

* chi square test, p value < 0.05
** p value < 0.05, odds-ratio 5.9

RESULTS

Two hundred children were admitted into our study and one was excluded from the analysis because of missing data. Tables I and II summarise the results of our study. Body weights ranged from 3.39 kg to 44 kg.

None of the 199 children received prophylactic antiemetics. Seventeen children vomited, resulting in an incidence of POV of 8.5%. Of those who vomited, only one child, a 12-year-old boy undergoing circumcision, received droperidol as rescue antiemetic.

Initial analysis with chi-squared test showed that trimeprazine premedication significantly lowered the incidence of POV (0% vs 11.4% in children who were unpremedicated, $p < 0.05$, Table II). Subsequent analysis with multivariate logistic regression analysis and stepwise variable selection method however, showed that duration of general anaesthesia greater than one hour was the only significant factor in POV ($p < 0.05$, odds ratio 5.9, Table II). Trimeprazine premedication was not found to be a significant factor in POV because 49 out of the 50 children who received trimeprazine premedication underwent general anaesthesia lasting one hour or less and only one child underwent general anaesthesia for more than an hour. Age, sex, body weight, duration of fasting, type of general surgical procedure, maintenance technique for general anaesthesia and the administration of opioids or local anaesthetics were not associated with a higher incidence of POV (Tables I and II).

DISCUSSION

Nausea and vomiting form part of the body's natural defence system against ingested toxins. Emetic detectors include afferents from the pharynx, gastrointestinal tract, mediastinum, chemoreceptor trigger zone in the area postrema and afferents from higher cortical centres (including the visual centre and the vestibular portion of the eighth cranial nerve)[3].

The incidence of only 8.5% in this study was probably due to the fact that children undergoing operations associated with a higher risk of POV eg. ENT, dental and strabismus correction were not involved. We decided to include only children undergoing outpatient general surgical procedures in this study as they form the bulk of the paediatric surgical patients in our hospital.

We found that a longer duration of general anaesthesia is associated with a higher incidence of POV. Other investigators[4,5] have also found this to be so. The relationship between the length of the anaesthetic and postoperative emesis is not easily explained. It has been postulated that increased effects of premedication, anaesthetics including nitrous oxide, prolonged fasting and increased pain may play a role[6]. We did not prove any of these postulations in our study. Also, extended periods of immobilisation in the recumbent posture under general anaesthesia leads to a decrease in tonic discharge from the vestibular labyrinths for the duration of the procedure. Such a state of immobility is never experienced naturally, not even during sleep. As the patient

awakens at the end of the anaesthetic and starts to move his head, there is a sudden vestibular discharge and this is thought to cause emesis[7].

Trimeprazine is a phenothiazine with known antiemetic properties. The fact that its administration was not a significant factor in decreasing the incidence of POV is due to the presence of short exposure to general anaesthesia as a confounding factor. To further evaluate its role in postoperative emesis, another study needs to be carried out whereby administration of trimeprazine premedication is the only variable factor.

It has been observed that the incidence of POV in the paediatric population increases with age from 20% in those aged 1 – 5 years and reaches a peak incidence of about 33% in the 11 – 14 years age group[3,6]. However, its etiology is unknown[1,8]. This relationship between age and POV was not demonstrated in our study because of the difference in study population.

Postoperative emesis is reported to be higher in patients undergoing general anaesthesia with spontaneous respiration via masks compared to those undergoing general anaesthesia with intermittent positive pressure ventilation via endotracheal tubes. This is because vigorous 'bagging' via masks, particularly by the less experienced anaesthetists, causes gas to pass into the stomach and upper intestines. This leads to distension and activation of the abdominal, vagal and splanchnic afferents which in turn may trigger emesis[6]. This relationship was not demonstrated in our study possibly as a result of the close supervision of inexperienced medical officers by senior anaesthetists.

Although it is a common observation that all opioids, including the newer synthetic opioid like sufentanil and alfentanil, are associated with an increased risk of POV[3,9], we did not find this to be so with intravenous morphine $\leqslant$ 0.1 mg/kg or intravenous fentanyl $\leqslant$ 1 μg/kg administered for procedures lasting 10 minutes to 120 minutes. This is possibly due to the fact that pain itself is associated with nausea and vomiting and adequate pain relief results in a reduction in the incidence of emesis[10]. Of the 21 children who received opioids, 19 received it at induction and the remaining 2 received it in the recovery room. All the 3 patients who vomited had received intravenous fentanyl $\leqslant$ 1 μg/kg at induction.

The activation of nociceptors by pain stimulus is thought to produce longer lasting changes in the central nervous system that can alter the threshold for emesis[7]. The elimination of pain by the use of local anaesthetics will therefore decrease the incidence of POV. Our finding did not confirm this.

As with other studies, we did not find any sex predilection for POV in children younger than 11 years of age[3]. Increased body weight too, was not found to increase the risk of postoperative emesis[11]. Literature search, however, reveals conflicting reports for the relationship between body habitus and POV[3,4]. There was no relationship between the duration of fasting and POV.

In our study, we noted that POV did not result in unplanned admissions in day surgical patients.

CONCLUSION

In conclusion, our study revealed that the incidence of postoperative emesis in the local paediatric outpatient general surgical population is 8.5%. Age, sex, body weight, duration of fasting, trimeprazine premedication, type of general surgical procedure and maintenance technique for general anaesthesia do not increase the risk of POV. Duration of general anaesthesia greater than one hour is associated with a significantly higher incidence of POV. The routine administration of prophylactic antiemetics to all paediatric outpatient general surgical patients is not cost-effective. It may be more cost-effective to target prophylactic antiemetics at patients scheduled for longer as well as higher risk procedures eg. ENT, dental and strabismus correction. Since antiemetics are not without their side-effects, rescue antiemetics should only be administered when required. It is reassuring to note that POV is not a reason for unplanned admissions for paediatric outpatient general surgical patients in our hospital.

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