The effect of preoperative oral droperidol on the incidence of postoperative emesis after paediatric strabismus surgery

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Most children vomit after strabismus surgery. Administration of intravenous droperidol to unpremedicated paediatric patients following induction but prior to eye manipulation markedly reduces the incidence of postoperative emesis. This study tested the hypothesis that even earlier administration of droperidol, orally as a component of an oral premedication, would further reduce the incidence of postoperative emesis in this group of patients. Sixty-five patients were randomized into three premedication groups. One group received the standard oral premedication used for all outpatients at our institution (meperidine $1.5 \text{ mg} \cdot \text{kg}^{-1}$, diazepam $0.15 \text{ mg} \cdot \text{kg}^{-1}$, atropine $0.02 \text{ mg} \cdot \text{kg}^{-1}$). In the other two groups, droperidol in a dose of 50 or $75 \text{ } \mu\text{g} \cdot \text{kg}^{-1}$ was substituted for the diazepam. Droperidol-treated groups demonstrated a significantly lower incidence of vomiting prior to hospital discharge compared to the groups that received the standard oral premedication (standard – 73 per cent, $50 \text{ } \mu\text{g} \cdot \text{kg}^{-1}$ droperidol – 33 per cent, $75 \text{ } \mu\text{g} \cdot \text{kg}^{-1}$ droperidol – 36 per cent) without prolonging hospital stay.

Key words

ANAESTHESIA: paediatric, ophthalmologic, outpatient;
VOMITING: incidence; PREMEDICATION: oral, droperidol;
SURGERY: strabismus.

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Strabismus correction is the most frequent eye operation performed in children. Vomiting following strabismus surgery occurs in 41–85 per cent of patients.^{1–3} Vomiting is unpleasant and can be severe enough to cause dehydration or result in the need for the child who would otherwise be an outpatient to remain hospitalized overnight. Administration of intravenous droperidol ($75 \text{ } \mu\text{g} \cdot \text{kg}^{-1}$) to unpremedicated children at the time of induction, prior to manipulation of the extraocular muscles, reduces the incidence of postoperative emesis more than any other reported treatment.³ However, many anaesthetists choose to give oral premedication to day-surgery patients in order to improve induction conditions.⁴ Administration of intravenous droperidol following induction, in addition to oral premedication, might unduly prolong discharge time.

We undertook this study to test the hypothesis that an oral premedication containing droperidol would be more effective in the prophylaxis of emesis in children undergoing strabismus surgery without prolonging discharge time than intravenous droperidol after anaesthetic induction.

Methods

Following approval of the Committee for the Protection of Human Subjects at our institution, a prospective, double-blind randomized study was undertaken in 65 ASA physical status I or II children aged one to 16 years undergoing strabismus surgery as outpatients. After obtaining informed consent, children were randomly assigned by the pharmacy to receive one of three premedicants: Group I – standard (meperidine $1.5 \text{ mg} \cdot \text{kg}^{-1}$, diazepam $0.15 \text{ mg} \cdot \text{kg}^{-1}$, atropine $0.02 \text{ mg} \cdot \text{kg}^{-1}$), Group II – low-dose droperidol (meperidine $1.5 \text{ mg} \cdot \text{kg}^{-1}$, droperidol $50 \text{ } \mu\text{g} \cdot \text{kg}^{-1}$, atropine $0.02 \text{ mg} \cdot \text{kg}^{-1}$) and Group III – high-dose droperidol (meperidine $1.5 \text{ mg} \cdot \text{kg}^{-1}$, droperidol $75 \text{ } \mu\text{g} \cdot \text{kg}^{-1}$, atropine $0.02 \text{ mg} \cdot \text{kg}^{-1}$). All premedication was dispensed in a volume

of $0.35 \text{ ml} \cdot \text{kg}^{-1}$ and was given 30–90 minutes prior to induction.

Anaesthesia was induced with mask nitrous oxide (70 per cent), oxygen and halothane. After intravenous administration of a nondepolarizing muscle relaxant and controlled ventilation with 100 per cent oxygen, the trachea was intubated and the stomach aspirated.

Anaesthesia was maintained with the same agents used for induction. Intravenous fluids were administered to replace the preoperative deficit and supply ongoing maintenance requirements. All patients were extubated awake in the operating room, as is our routine, on completion of the surgery following administration of neostigmine and atropine. After an initial period in the postanaesthesia recovery room (PAR), children returned to the day surgery unit (DSU) until they met our usual discharge criteria: stable vital signs, a clear sensorium, minimal vomiting and the ability to tolerate clear liquids. The time spent in the PAR and DSU was determined by the child's anaesthetist who was also blinded to the premedication the child had received. Antiemetics (prochlorperazine and trimethobenzamide) were administered as deemed necessary by the clinicians caring for the children. No analgesics were administered during or after the anaesthetic.

Age, weight, sex, previous strabismus surgery, number of extraocular muscles repaired, clinical sedation, number of vomiting episodes in the PAR and DSU, duration of stay in the PAR and DSU, and any abnormal behaviour were recorded by one of the investigators on a data collection sheet which followed the child through surgery, the PAR and the DSU. Phone contact was made with the child's parent the day following the procedure by the anaesthesia nurse specialist, who did not know what premedication the child had been given, to determine the incidence of vomiting and prolonged somnolence at home.

Statistical significance ($p < 0.05$) was determined using analysis of variance, the Student-Newman-Keuls test and Chi-squared analysis.

Results

The groups were similar in age, weight, sex, history of previous strabismus surgery and the number of extraocular muscles repaired (Table I). The sedative effect of the oral premedication did not differ between groups.

The incidence of vomiting in the PAR for either droperidol-treated groups was significantly lower than in the group which received the standard oral premedication (Table II). No patient who received the premedication containing $75 \mu\text{g} \cdot \text{kg}^{-1}$ of droperidol vomited in the PAR. The incidence of vomiting in the DSU was lower among

TABLE I Study population
(no statistically significant differences between groups)

	Standard premedication	Droperidol ($50 \mu\text{g} \cdot \text{kg}^{-1}$)	Droperidol ($75 \mu\text{g} \cdot \text{kg}^{-1}$)
Sample size	22	21	22
Age (yr)*	3.8 ± 1.8	4.8 ± 3.4	5.6 ± 4.8
Weight (kg)*	19.4 ± 12.0	19.9 ± 12.6	21.4 ± 12.6
Sex (M/F)	13/9	16/5	13/9
Previous eye surgery	10	3	6
Number of muscles repaired†	2(1–3)	2(1–4)	2(1–6)
Unilateral/bilateral surgery	4/18	6/15	5/16

*Data are mean $\pm$ SD.

†Median (range).

patients who received droperidol but the results were not statistically significant. The overall incidence of vomiting predischARGE was significantly lower in both droperidol-treated groups as compared to the standard group. The duration of time in the recovery room was shorter in both droperidol-treated groups compared to the group given the standard premedication. Hospital stay was not prolonged by administration of either dose of droperidol. Postoperative somnolence was not more frequent among patients who received droperidol. No patient experienced extrapyramidal symptoms.

Discussion

Brzustowicz *et al.* demonstrated that an oral premedication containing meperidine, diazepam and atropine could be safely used in healthy paediatric outpatients to provide favourable induction conditions without prolonging recovery time.⁴ We routinely use this premedicant in all healthy outpatients, including those having strabismus surgery, to produce a smoother induction and have been satisfied with the results. Using this premedication, the incidence of postoperative retching and vomiting is under ten per cent in all outpatients at our institution. The incidence of vomiting in outpatients who received this premedication prior to strabismus surgery is 70–80 per cent. We, like others, sought to reduce this unpleasant and costly problem. Droperidol has been shown to be an effective antiemetic in children undergoing strabismus surgery.^{2,3} Previous studies vary widely in the incidence of vomiting among both the control and the droperidol treated groups. Abramowitz *et al.* demonstrated a reduction in the incidence of postoperative emesis from 85 to 43 per cent in unpremedicated paediatric patients when $75 \mu\text{g} \cdot \text{kg}^{-1}$ of droperidol was given intravenously 30 minutes prior to completion of the surgery.² Lerman *et al.* demonstrated that the incidence of vomiting was reduced

TABLE II Results

	Standard premedication	Droperidol (50 $\mu\text{g} \cdot \text{kg}^{-1}$)	Droperidol (75 $\mu\text{g} \cdot \text{kg}^{-1}$)
<i>Incidence of vomiting (%)</i>			
PAR	55	14*	0*
DS	59	29	36
Predischarge #	73	33*	36*
Postdischarge	43	33	32
<i>Number of vomiting episodes</i>			
PAR	0.9 $\pm$ 1.2	0.2 $\pm$ 0.5*	0*
DS	1.6 $\pm$ 2.3	0.8 $\pm$ 1.7	0.7 $\pm$ 1.2
Predischarge #	2.5 $\pm$ 3.1	1.0 $\pm$ 1.8*	0.7 $\pm$ 1.2
Postdischarge	0.6 $\pm$ 0.8	0.6 $\pm$ 1.2	0.9 $\pm$ 1.6
<i>Number of vomiting episodes among those who vomited</i>			
Predischarge #	3.4 $\pm$ 3.2	3.0 $\pm$ 2.1	2.0 $\pm$ 1.1
Time in PAR (min)	67 $\pm$ 13	62 $\pm$ 6*	60 $\pm$ 4*
Time to discharge (min)	304 $\pm$ 117	265 $\pm$ 116	266 $\pm$ 111
Antiemetics administered in hospital	10	4	4

* $p < 0.05$ (method) from standard premedication.

#PAR + DS.

No statistically significant differences between droperidol groups.

by 80 per cent (46 to 10 per cent) when 75 $\mu\text{g} \cdot \text{kg}^{-1}$ of droperidol was given intravenously on induction but prior to manipulation of the eye in unpremedicated children.³

We considered giving 75 $\mu\text{g} \cdot \text{kg}^{-1}$ of intravenous droperidol to our premedicated patients but were concerned that the combination of premedication and droperidol might delay emergence and/or prolong discharge time. We were not willing to forgo the desirable perioperative conditions achieved with premedication. At the time Bruzstowitz performed his study, meperidine was the only narcotic commercially available as a suspension.⁴ Consideration was given to changing the narcotic in the premedicant to morphine which is now commercially available for patients scheduled for strabismus surgery who have a high incidence of vomiting. A decision was made not to replace the meperidine as we found the incidence of vomiting in patients given the oral meperidine, diazepam and atropine to compare favourably with the incidence of vomiting in other children at our institution who had received no premedication or other premedicants (no premedication – 12 per cent, oral valium – 16 per cent, intramuscular atropine – 6 per cent and intramuscular morphine, pentobarbitone and atropine – 7 per cent).⁵ We replaced the diazepam in our standard outpatient oral premedication with droperidol in an attempt to retain the desirable properties of the premedication and to decrease the incidence of postopera-

tive emesis without introducing any adverse side effects. We selected the droperidol doses of 50 and 75 $\mu\text{g} \cdot \text{kg}^{-1}$ as our clinical experience indicated that these doses produced sedative effect comparable to 0.15 mg $\cdot \text{kg}^{-1}$ of diazepam. Study results indicated that the sedative effect of the oral premedication did not differ among the three groups. This data would be consistent with the hypothesis that the mechanism by which droperidol reduces emesis may be a specific effect rather than as a result of its non-specific sedative action.

The droperidol-treated groups demonstrated a significantly lower incidence of vomiting prior to hospital discharge (low dose – 33 per cent, high-dose – 36 per cent) compared to the group which received the standard premedication (73 per cent). Droperidol was most effective in the early postoperative period (PAR) where there was a 0 and 14 per cent incidence of vomiting in the high and low droperidol-treated groups respectively compared to a 55 per cent incidence in the children who received the standard oral premedication. By the time the child reached the DSU, although the incidence was lower in the high and low droperidol groups (36 per cent, 29 per cent) compared to the standard premedication group (59 per cent), the results did not achieve statistical significance. From discharge to the morning following the procedure, there was even less difference in the incidence of vomiting among the three groups. The fact that 45 per cent of the control group compared to 19 per cent of those given droperidol received other antiemetics in the postoperative period by the clinicians caring for them may in part

*Godinez RI. The Children's Hospital of Philadelphia, Philadelphia, Pa. Personal communication.

explain the lack of difference in the incidence of vomiting in the later postoperative period among the three groups.

Our data demonstrate a 50 per cent reduction in the incidence of vomiting prior to discharge in the droperidol-treated groups compared to the group which received the standard oral premedication. The reduction of vomiting in our patients is less than the 80 per cent reduction reported by Lerman, Eustis and Smith.³ Different anaesthetic techniques may be in part responsible for the different results. We did not alter our routine clinical practice for the purpose of the study which consists of using inhalational inductions, controlling ventilation in a patient paralyzed with a nondepolarizing muscle relaxant and aspirating all patient's stomachs following tracheal intubation. Lerman *et al.* induced the children with thiopentone, gave intravenous atropine at the time of induction and did not aspirate the stomach.³ Alternatively, the lesser effect in our study may be due to the first pass metabolism of oral droperidol. It is possible that higher oral doses of droperidol given preoperatively may be as effective as $75 \mu\text{g} \cdot \text{kg}^{-1}$ of intravenous droperidol at the time of induction.

Experience at our institution using oral premedication, dispensed in a volume of $0.25\text{--}0.35 \text{ ml} \cdot \text{kg}^{-1}$, in both outpatients and inpatients since 1982 and 1984 respectively indicates the incidence of aspiration to be 2 in 40,000 patients. This incidence compares favourably with the aspiration risk in paediatric patients given no or non-oral premedication.

The data demonstrates that oral droperidol does reduce the incidence of vomiting following paediatric strabismus surgery. Further investigation is needed to determine the ideal premedication, the dose, route and timing of droperidol administration and anaesthetic technique to maximally reduce the incidence of vomiting in children requiring strabismus surgery.

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Résumé

La majorité des enfants vomissent après chirurgie pour correction de strabisme. L'administration intraveineuse de droperidol aux enfants non-prémédiqués après l'induction mais avant la manipulation de l'œil réduit significativement l'incidence des vomissements postopératoires. Cette étude veut vérifier l'hypothèse que l'administration plus précoce de droperidol par voie orale avec la prémédication orale diminuera l'incidence de vomissement postopératoire dans ce groupe de patients. Soixante-cinq patients ont été randomisés en trois groupes. Un groupe a reçu la prémédication orale standard (mépéridine $1.5 \text{ mg} \cdot \text{kg}^{-1}$, diazépam $0.15 \text{ mg} \cdot \text{kg}^{-1}$, atropine $0.02 \text{ mg} \cdot \text{kg}^{-1}$). Dans les deux autres groupes, du droperidol à des doses de 50 ou $75 \mu\text{g} \cdot \text{kg}^{-1}$ a été substitué pour le diazépam. Les groupes traités au droperidol ont démontré une diminution significative de l'incidence de vomissement avant leur congé de l'hôpital comparé au groupe qui a reçu la prémédication orale standard (standard – 73 pour cent, $50 \mu\text{g} \cdot \text{kg}^{-1}$ – 33 pour cent, $75 \mu\text{g} \cdot \text{kg}^{-1}$ droperidol – 36 pour cent) sans que leur séjour à l'hôpital soit prolongé.