Ineffectiveness of acupuncture and droperidol in preventing vomiting following strabismus repair in children

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The antiemetic effects and side-effects of P6 acupuncture and droperidol pre-treatment were evaluated in a randomized, patient- and observer-blinded study. Ninety unpremedicated children of ASA physical status I or II undergoing outpatient strabismus repair, and aged over one year, were studied. All patients received intravenous thiopentone 5 mg · kg^{-1}, atropine 0.02 mg · kg^{-1} and succinylcholine 1.5 mg · kg^{-1}, and the trachea was intubated. Patients then received either intravenous droperidol 0.075 mg · kg^{-1}, droperidol plus five minutes' P6 acupuncture, or acupuncture alone. Anaesthesia was maintained with nitrous oxide 66% and halothane 1.5–2.0% in oxygen with spontaneous ventilation. There was no difference in the incidence of vomiting in the droperidol group (17% before discharge from hospital and 41% up to 48 hours after discharge), combined treatment group (17% and 34% respectively) and acupuncture group (27% and 45% respectively). Corresponding figures for the incidence of vomiting before discharge were 17%, 17% and 27% respectively; these values were also not different. The incidence of restlessness was significantly greater in children receiving droperidol (63%) or both treatments (67%) than in those receiving acupuncture alone (30%; P = 0.007). P6 acupuncture and droperidol are equally ineffective in preventing vomiting within 48 hours of paediatric strabismus repair. Droperidol is associated with increased incidence of postoperative restlessness.

Les effets antiémétiques et les effets secondaires de l'acupuncture P6 et d'un prétraitement au dropéridol ont été évalués lors d'une étude à double insu et au hasard. Quatre-vingt-dix enfants non prémédiqués, classés ASA I ou II, devant subir une chirurgie pour strabisme en cas d'un jour et âgés de plus d'un an, ont été étudiés. Tous les patients ont reçu du thiopental 5 mg · kg^{-1}, de l'atropine 0,02 mg · kg^{-1} et de la succinylcholine 1,5 mg · kg^{-1} iv et la trachée a été intubée. Par la suite, les patients ont reçus soit une dose intraveineuse de dropéridol de 0,075 mg · kg^{-1}, soit du dropéridol et 5 minutes d'acupuncture P6, ou seulement de l'acupuncture. L'anesthésie était maintenue à l'aide de protoxyde d'azote 66% et d'halothane 1,5 à 2% avec oxygène, sous ventilation spontanée. Il n'y avait aucune différence dans l'incidence de vomissements chez le groupe dropéridol (17% avant le congé de l'hôpital et 41% jusqu'à 48 heures après le congé), le groupe avec traitement combiné (17% et 34% respectivement) et le groupe acupuncture (27% et 45% respectivement). Les figures correspondantes pour l'incidence de vomissements avant le congé étaient de 17%, 17% et 27% respectivement; ces valeurs n'étaient également pas différentes. L'incidence d'agitation était significativement plus élevée chez les enfants recevant du dropéridol (60%) ou les deux traitements (67%) que chez ceux recevant seulement l'acupuncture (30% ; P = 0,007). L'acupuncture P6 et le dropéridol sont tous les deux inefficaces dans la prévention des vomissements, dans les premières 48 heures d'une chirurgie pédiâtrique pour le strabisme. Le dropéridol est associé à une incidence augmentée d'agitation postopératoire.

Key words
ANAESTHESIA: paediatric;
ANAESTHETIC TECHNIQUES: acupuncture;
SURGERY: ophthalmic, paediatric;
VOMITING: droperidol, incidence.

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Postoperative vomiting has been reported in 41–85% children after strabismus repair.[1–10] Intravenous adminis-

tration of droperidol 0.075 mg · kg^{-1} before manipulation of the eye has reduced the total incidence of postoperative vomiting to 16%.[4] However, droperidol may be associated with increased postoperative sleepiness and extrapyramidal symptoms.[3,5,11]

Stimulation of the P6 acupuncture point has no side-effects and reduces nausea and vomiting in adults undergoing gynaecological procedures[12,13] and chemotherapy.[14,15] This point ("Neiguan") is situated two "Chinese inches" (i.e., two widths of the intraphalangeal joint of the patient's thumb) proximal to the distal skin crease of the wrist.[16] The mechanism of acupuncture antiemesis is unclear. A dual effect of endogenous opioids on the vomiting centre has been suggested with acupuncture increasing endorphin-mediated antiemetic tone. Children are included in the group termed "strong reactors," who respond well to acupuncture in general.[17] The antiemetic effect of P6 acupuncture was thus evaluated in children undergoing outpatient strabismus surgery.

Methods

After institutional ethical committee approval, informed written consent was obtained from the parents of 90 children ASA physical status I or II, aged 1–16 years, and presenting for elective outpatient strabismus surgery. The patients were randomly assigned to three groups, to receive droperidol (Group D), acupuncture plus droperidol (Group AD), or acupuncture alone (Group A), following induction of anaesthesia. No premedication was given. All patients received intravenous thiopentone 5 mg · kg^{-1}, atropine 0.02 mg · kg^{-1} and succinylcholine 1.5 mg · kg^{-1}. Patients in Groups D and AD also received intravenous droperidol 0.075 mg · kg^{-1}. Manual inflation of the lungs, taking care not to inflate the stomach, was followed by tracheal intubation and spontaneous ventilation with nitrous oxide 66% and halothane 1.5–2.0% in oxygen. Patients in Groups A and AD received acupuncture at the P6 point on the right side with five minutes manual stimulation, using sterile disposable 0.2 mm diameter acupuncture needles. All the acupuncture was administered by one investigator (SY) immediately following induction and before surgery. It was administered after induction of anaesthesia to avoid frightening the children, although acupuncture is painless and tolerated well by adults. Estimated fluid deficit and maintenance requirements were replaced with intravenous Ringer's lactate solution. Intramuscular dimenhydrinate 1.0 mg · kg^{-1} was available if the incidence of vomiting exceeded three episodes during any one hour. Rectal acetaminophen 10 mg · kg^{-1} or intramuscular codeine phosphate 1.0 mg · kg^{-1} was available after surgery as required for pain.

The incidence of vomiting and/or retching was recorded in the postanaesthetic recovery room (PAR) and ward. Whether or not patients received droperidol, both treatments or acupuncture alone, was unknown to the staff, the patients and their parents. Other data collected included age, sex, duration of anaesthesia, number of muscles repaired, duration of stay in the PAR, PAR recovery scores at 0, 15 and 30 min,[18] postoperative drug requirements, time to drinking fluids and time to discharge from hospital. Restlessness was defined as irritability or difficulty in settling postoperatively. The parents of each child were contacted 48 hr after surgery and asked about the incidence of vomiting at home.

Statistical significance ($P < 0.05$) was determined using analysis of variance with Student-Neuman-Keuls test for age, weight, anaesthetic time, duration of stay in the PAR, time to drinking and time to discharge; chi-squared analysis was used for incidence of vomiting and restlessness, and the Kruskal-Wallis test for PAR scores and number of muscles repaired.

Results

There was one patient in each group whose parents could not be contacted after surgery. Age, weight, number of muscles repaired and duration of anaesthesia did not differ among the groups (Table). There was no difference among groups for total incidence of vomiting: 41% in Group D, 34% in Group AD and 45% in Group A, or incidence of vomiting before discharge: 17%, 17% and 27% respectively. Restlessness was more frequent in children who received droperidol (65%) than those who received acupuncture alone (30%; $P < 0.001$). Duration of stay in the PAR, PAR scores, time to drinking and discharge, and postoperative analgesic requirements did not differ among the groups.

Vomiting was not associated with the duration of anaesthesia or the number of muscles repaired.

Overnight admission to hospital, or readmission following discharge, was not required in any case. There were no complications related to this study.

Discussion

We found no difference in the incidence of postoperative vomiting after acupuncture, droperidol or both treatments combined. The unexpectedly high incidence of vomiting in the droperidol group is in contrast to an earlier study by Lerman *et al.* in which 10% of children receiving droperidol 0.075 mg · kg^{-1} pre-treatment vomited before discharge, with a total incidence of only 16%.[4] However, a recent study reported a 56% total incidence of vomiting following droperidol 0.075 mg · kg^{-1}.[10] The low pre-discharge incidence of 8% in the latter study may have been related to the shorter time to discharge (3.3 ± 1 hr, compared with 6.4 ± 1.6 hr in the study by Lerman *et al.*). In another study, the pre-discharge (before 4.6 ± 0.6 hr)

TABLE Demographic data and incidence of vomiting and restlessness following strabismus repair

	Groups		
	D	*AD*	*A*
Number of patients	30	30	30
Age (yr)*	5.8 ± 4.5	5.7 ± 4.0	5.8 ± 3.0
Weight (kg)*	24.0 ± 13.0	23.4 ± 15.9	21.3 ± 8.2
No. muscles repaired†	2(1–4)	2(1–4)	2(1–4)
Duration of anaesthesia (min)*	37 ± 14	39 ± 12	39 ± 13
PAR time (min)*	69.0 ± 21.2	69.0 ± 18.7	72.2 ± 28.7
Time till drinking (hr)*	3.2 ± 0.6	3.3 ± 0.9	3.1 ± 1.1
Time to discharge (hr)*	4.4 ± 0.8	4.3 ± 0.8	4.8 ± 1.4
Vomiting pre-discharge‡	5(17%)	5(17%)	8(27%)
Vomiting in total‡	12(41%)	10(34%)	13(45%)
Restlessness‡	19(63%)	20(67%)	9(30%)§

*Mean ± SD; †median (range); ‡number (incidence); §$P < 0.05$ when compared with groups D and AD.

incidence of vomiting was 22% in children pretreated with droperidol 0.075 $mg \cdot kg^{-1}$, although vomiting was not assessed after discharge from hospital.[8] Our anaesthetic technique differed from that of Lerman *et al.* only by the use of spontaneous ventilation instead of intermittent positive pressure ventilation (IPPV). However, Walsh *et al.* found no difference in the incidence of vomiting following spontaneous ventilation or IPPV,[6] and IPPV was also used in a study in which 56% children vomited despite droperidol pretreatment.[10] A further difference was the earlier discharge of children in our study (4.4 ± 0.8 hr). It is thus possible that early postoperative mobilization is associated with increased postoperative vomiting, and this merits further investigation.

The incidence of vomiting in the acupuncture group (27% before discharge from hospital, 45% in total) compares with previously reported control group incidences of 41–85% before discharge,[4,5,9] and 52–60% in total.[4,5,7] We were unable to use a control group receiving no prophylactic antiemetic treatment since droperidol was part of the standard anaesthetic management for strabismus surgery in this institution, and to have such a control group for our study (which was started before publication of the study by Blanc *et al.*) was considered unacceptable. In the light of our findings and those of Blanc *et al.*, who also used droperidol as a control treatment, this may not be the case. In adults, P6 acupuncture has been shown to prevent postoperative vomiting when administered both before [12] and after surgery,[13] although not when administered during anaesthesia but after opioid administration.[19] These findings suggest that general anaesthesia suppresses the antiemetic effect of acupuncture. In a study performed concurrently with this one, we have recently found no antiemetic effect of acupuncture administered during anaesthesia on postoperative vomiting after tonsillectomy in children.[20] If acupuncture requires patients to be awake in order to be effective, this may limit its acceptability, especially to younger children and their parents. Although the incidence of vomiting in the combined treatment group was lower than that for either treatment alone, this difference was not significant. Power analysis revealed that in order to show a true difference of the measured magnitude between Groups A and AD, over 300 patients would be required in each group.[21] Acupressure, the continued application of pressure to the P6 point using an elasticated wristband, may be more acceptable to patients because no needles are involved.[12] However, a recent study of acupressure in paediatric strabismus repair found no antiemetic effect when compared with placebo.[22]

Although the duration of postoperative recovery and the time to discharge from hospital were not different among the groups, this study confirmed our clinical suspicion that children who receive droperidol were more likely to be restless postoperatively. It should be noted that according to our definition of restlessness, 30% of children not receiving droperidol were also restless. However, this incidence was doubled following the administration of droperidol.

In summary, we found no difference in the incidence of vomiting after acupuncture, droperidol and acupuncture-droperidol combined. We conclude that acupuncture is as effective, or ineffective, as droperidol. The value of droperidol in anaesthesia for strabismus surgery requires reassessment, especially in view of the increased incidence of restlessness following its use.

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