



Preventing motion sickness in children

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Summary

Motion sickness is a normal response to abnormal stimuli. The peak incidence occurs in children under 12 years, but it is uncommon in infants. As this condition has central and vestibular origins, centrally acting drugs may be useful. There is no evidence to support the efficacy or safety of drugs for children less than two years old. Potentially effective drugs in older children include hyoscine and antihistamines. Both are associated with anticholinergic adverse effects. Ginger and acupuncture bands may be used, but have only been evaluated in adults.

Key words: antihistamines, hyoscine, travel.

(*Aust Prescr* 2009;32:61–3)

Introduction

Motion sickness is a common condition, with about 30% of the general population suffering some kind of symptoms during a voyage and 5% suffering heavily. There are no specific statistics for incidence in children. Children under two years old are highly resistant to motion sickness, as they are often supine and do not use visual cues for spatial orientation. Susceptibility peaks around 10–12 years of age. Motion sickness in children occurs mainly during car, train and air travel, but also may occur on amusement park rides and during virtual reality immersion.¹

There are simple preventative measures which may reduce the likelihood of travel sickness (see box). If these fail, pharmacological therapies may be tried in children older than two years.

Rationale for pharmacological management

Conflicting signals from vestibular, vision and proprioception systems produce symptoms of pallor and cold sweat, which usually precede epigastric discomfort, nausea and emesis. Ataxia and dizziness may be a feature in younger children. Prolonged motion sickness may cause drowsiness, apathy and even a feeling of impending doom. Cortical centres may also be involved, explaining the effect of anticipatory nausea before travelling.

The first mention of a drug for motion sickness was in the 1860s in the *Lancet*, when tincture of belladonna was recommended.

Promethazine was approved in the 1950s, but it is only since the 1970s that cholinergic stimulation has been the postulated basis of motion sickness. Primarily, antihistamines and anticholinergics are used. These drugs act on vestibular receptors and nuclei, the cerebellum and the vomiting centre.

Treatment options²

The following general points should be considered when managing children who are prone to motion sickness:

- As motion sickness induces gastric stasis, it slows drug absorption, so preventing symptoms from occurring is more effective than trying to treat them after symptom onset.
- There are no controlled studies of anti-motion sickness drugs in young children. Clinical use is based on pharmacology principles and extrapolation of data from adult studies.
- While most anti-motion sickness medicines cause drowsiness, they should not be used as sedatives for air travel, as excessive sedation combined with lower oxygen partial pressure can be potentially dangerous for some children.³
- All anti-motion sickness medications are also effective antiemetics.

Simple ways to prevent travel sickness^{2,4}

- Focus child's attention elsewhere, e.g. out of the window, on the horizon where practical
- Do not encourage reading or focusing on games while travelling
- Avoid unnecessary head movements by using pillows or a headrest
- If travelling by car, seat child near the front of the vehicle, that is, middle rather than third row in a larger vehicle
- If flying, sit over the aeroplane wing – the ride tends to be less bumpy
- Have the child recline as much as possible
- Feed the child a light snack before travelling – avoid heavy, greasy meals
- Ensure ventilation either from open window or air conditioning – avoid overheating
- Try to keep calm – motion sickness is more likely to happen if a child is worried about having an episode

Efficacy and safety

Hyoscine hydrobromide (scopolamine)

A systematic review of 14 controlled trials involving hyoscine found it to be more effective than placebo, but not superior to antihistamines. Studies were predominantly in adult males. Hyoscine is less sedating than antihistamines, but has more anticholinergic effects.⁵

Antihistamines

Given their lack of efficacy and potential to cause serious adverse drug reactions, such as hallucinations, agitation and breathing difficulties, antihistamines (H₁ receptor antagonists) should not be used to prevent or treat motion sickness in children less than two years of age and should be used with caution in older children. Fatalities have been reported when over-the-counter products containing antihistamines were given to young children to treat coughs and colds.⁶ There are no specific paediatric data for these drugs in motion sickness and dosing has been extrapolated from studies done in adults. In Australia, sedating antihistamines have recently become prescription-only for children less than two years of age.⁷ This is now in line with New Zealand regulations. These drugs cause anticholinergic adverse effects of excitability, agitation, drowsiness, dry mouth, blurred vision and constipation. They should be avoided in children with seizure disorders.

Promethazine theoclate, promethazine hydrochloride and dimenhydrinate are approved in Australia for prevention and treatment of motion sickness. Timing varies, but they should be given at least 30 minutes before travelling. While diphenhydramine is used overseas for motion sickness prophylaxis in children, this is not an approved indication in Australia.

Non-sedating antihistamines, such as loratadine and cetirizine, penetrate poorly into the central nervous system and are not effective against motion sickness.

Complementary alternatives

Studies in adults using acupuncture wristbands, which activate the P6 Neiguan acupuncture point (5 cm above the wrist), show relief of nausea in pregnancy and after chemotherapy, but evidence for efficacy in motion sickness is contradictory. There are no studies in children, although wristbands are marketed for this age group.

Placebos have provided benefit in up to 45% of cases in controlled studies.⁸

Ginger (*Zingiber officinale*) has been used for centuries for its antiemetic properties.⁹ Studies have shown reduced nausea in patients with hyperemesis gravidarum, postoperative nausea and vomiting and in a study using a revolving chair simulating motion sickness. There has not been more than anecdotal evidence of the efficacy of ginger for prevention and treatment

of motion sickness in children. Ginger inhibits thromboxane synthetase and in high doses may potentiate the effects of anticoagulants, for example aspirin, heparin and warfarin. It may cause mild gastrointestinal upset.

A study using prism glasses from the 1980s reported a significant decrease in vomiting episodes in children (n=201) prone to motion sickness. The prism glasses were thought to decrease the discrepancy between visual and vestibular cues and thus to reduce the negative effects of vertigo.¹⁰

Treatments available overseas^{2,11}

Hyoscine as a transdermal patch is available overseas for children older than 10 years. These patches have been shown to provide effective motion sickness prophylaxis for 72 hours, but have not been evaluated in younger children. Toxic psychosis has been reported in children using this treatment.

Cinnarizine and its derivative flunarizine are piperazine antihistamines with vasodilating actions of calcium channel blockers. The only study of anti-motion sickness drugs specifically in children was in an open study with cinnarizine. It was rated by participants (n=79, mean age 8.4 years) to be effective in preventing car sickness, with a low level of adverse effects.¹²

Conclusion

Motion sickness is a common condition, with many marketed remedies for children. Few have undergone controlled trials and even fewer have been scientifically tested specifically in children. The recent changes in labelling and restriction of access of antihistamines for children younger than two years of age highlight the importance of continual review of medicines used in children.

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Your questions to the PBAC

Patent expiry and 'new' drug approvals

The February issue of *Australian Prescriber* contains a review of desvenlafaxine with a comment on the expiry of the patent of modified-release venlafaxine (*Aust Prescr* 2009;32:22–3). There are other examples of 'new' drugs which are just small variations on the original molecule. These include perindopril erbumine becoming perindopril arginine and omeprazole becoming esomeprazole.

It appears that these small variations on a successful molecule are not great therapeutic advances. They seem to be produced only for commercial reasons. I would like to know why such products are added to the Pharmaceutical Benefits Scheme. They are unlikely to be more cost-effective than the old drugs already in use.

Bruce Sutherland
Pharmacist
St Arnaud, Vic.

PBAC response:

As the Schedule of Pharmaceutical Benefits is not a limited formulary, a 'new' drug such as these can be added even though several similar products are already listed.¹ As mentioned by your correspondent, these drugs are 'not great therapeutic advances' and are 'unlikely to be more cost-effective than the old drugs already in use'.

Perindopril arginine was accepted by the Pharmaceutical Benefits Advisory Committee (PBAC) as being bioequivalent to perindopril erbumine, while esomeprazole and desvenlafaxine were accepted on a cost-minimisation basis, where the evidence indicates that the new drug is no worse than an existing comparator (in this case, omeprazole and venlafaxine respectively). Once the new drug is considered to provide similar health outcomes to the comparator, the PBAC then makes a recommendation about the therapeutically equivalent

doses of the two drugs, based on all the evidence submitted at the time of listing, from which pricing is determined by the Pharmaceutical Benefits Pricing Authority. In the case of desvenlafaxine for major depressive disorders it was recommended on a cost minimisation basis with the parent drug venlafaxine, with the equi-effective doses being desvenlafaxine 50 mg and venlafaxine 75 mg. The PBAC considered that desvenlafaxine would provide a further treatment option for major depressive disorders, however, no evidence was presented to suggest that desvenlafaxine would offer an advantage for any particular patient group over the parent drug venlafaxine.²

In addition, the relative prices are adjusted depending on the actual prescribed daily doses in the marketplace. Both esomeprazole and perindopril arginine are in 'weighted average monthly treatment cost' groups of drugs regarded as therapeutically equivalent (the proton pump inhibitors and the ACE inhibitors). Pricing information using relative volumes of use and prescribed daily doses are compared across the group to determine the lowest priced drug in the group. The PBS subsidy is only provided at this lowest price.³

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