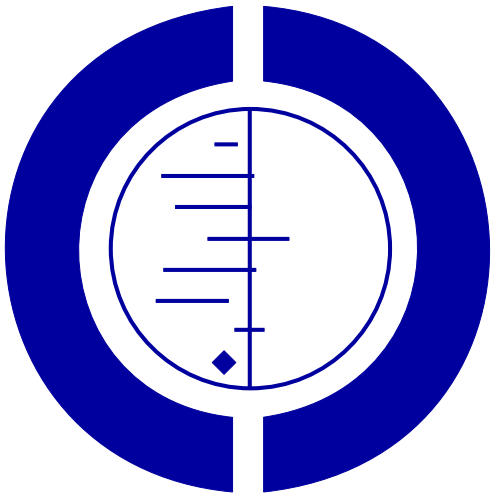
Stimulation of the wrist acupuncture point P6 for preventing postoperative nausea and vomiting (Review)

Lee A, Done ML



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ABSTRACT

Background
Postoperative nausea and vomiting (PONV) are common complications following surgery and anaesthesia. Drug therapy to prevent PONV is only partially effective. An alternative approach is to stimulate a P6 acupoint on the wrist. Although there are many trials examining this technique, the results are conflicting.

Objectives
To determine the efficacy and safety of P6 acupoint stimulation in preventing PONV.

Search strategy
We searched CENTRAL (***The Cochrane Library,*** Issue 1, 2003), MEDLINE (January 1966 to January 2003), EMBASE (January 1988 to January 2003) and the National Library of Medicine publication list of acupuncture studies up to and including January 2003. Reference lists of retrieved papers and reviews were consulted for additional references.

Selection criteria
All randomized trials of techniques that stimulated the P6 acupoint compared with: sham treatment or drug therapy for the prevention of PONV. Interventions used in these trials included acupuncture, electro-acupuncture, transcutaneous nerve stimulation, laser stimulation, acustimulation device and acupressure.

Data collection and analysis
Two reviewers independently assessed methodological quality and extracted the data. Primary outcomes were incidences of nausea and vomiting. Secondary outcomes were the need for rescue antiemetic therapy and adverse effects. A random effects model was used and relative risk (RR) with associated 95% confidence intervals (95% CI) are reported. Egger's test was used to measure the asymmetry of the funnel plot.

Main results
Twenty-six trials (n = 3347) were included, none of which reported adequate allocation concealment. There were significant reductions in the risks of nausea (RR 0.72, 95% CI 0.59 to 0.89), vomiting (RR 0.71, 95% CI 0.56 to 0.91) and the need for rescue antiemetics (RR 0.76, 95% CI 0.58 to 1.00) in the P6 acupoint stimulation group compared with the sham treatment, although many of the trials were heterogeneous. There was no evidence of difference in the risk of nausea and vomiting in the P6 acupoint stimulation group versus individual antiemetic groups. However, when different antiemetics were pooled, there was significant reduction in the risk of nausea but not vomiting in the P6 acupoint stimulation group compared with the antiemetic group (RR 0.70, 95% CI 0.50 to 0.98; RR 0.92, 95% CI 0.65 to 1.29 respectively). The side effects associated with P6 acupoint stimulation were minor. There was some evidence of asymmetry of the funnel plot.

Authors' conclusions
This systematic review supports the use of P6 acupoint stimulation in patients without antiemetic prophylaxis. Compared with antiemetic prophylaxis, P6 acupoint stimulation seems to reduce the risk of nausea but not vomiting.

SYNOPSIS

This review found evidence to support the use of P6 acupoint stimulation in preventing postoperative nausea and vomiting (PONV) with minimal side effects.

Postoperative nausea and vomiting (PONV) are two of the most common complications after surgery and anaesthesia. Drug therapy is only partially effective in preventing PONV and may cause adverse effects. Alternative methods, such as stimulating an acupuncture point on the wrist (P6 acupoint stimulation), have been studied in many trials. The use of P6 acupoint stimulation can reduce the risk of nausea and vomiting after surgery, with minimal side effects. Compared with antiemetic prophylaxis, P6 acupoint stimulation seems to reduce the risk of nausea but not vomiting.

BACKGROUND

Postoperative nausea and vomiting (PONV) are common complaints after general, regional or local anaesthesia (Watcha 1992), with incidences up to 80% (Sadhasivam 1999). Drug therapy is only partially effective in preventing or treating PONV (Gin 1994). Over 30 systematic reviews on PONV have been published (Tramer 2003). These reviews focus on antiemetics that are used in strabismus surgery; the effectiveness of using propofol or omitting nitrous oxide; avoiding antagonism of neuromuscular blockade; the efficacy of metoclopramide, droperidol, dexamethasone, 5-hydroxytryptamine receptor antagonists, dimenhydrinate, or transdermal scopolamine; and the efficacy of antiemetic interventions that are used to prevent opioid-induced nausea and vomiting (Tramer 2003). Recently, a multidisciplinary panel of experts convened to review the medical literature on PONV in order to produce guidelines for the prevention or minimization of PONV using prophylactic, or rescue therapy, either separately or in combination (Gan 2003).

As anaesthetists continue to search for more cost-effective approaches to improving patient outcome, attention has focused on simple, inexpensive and non-invasive methods to prevent PONV. There is interest in the use of alternative approaches to preventing emesis, brought about by concerns regarding side effects associated with traditional pharmacological antiemetics and the cost of newer agents.

Various non-pharmacological techniques have been examined as alternatives to antiemetic drugs in trials; these include acupuncture, electro-acupuncture, laser acupuncture, transcutaneous electrical nerve stimulation, acupoint stimulation and acupressure. Most non-pharmacological studies have focused on the stimulation of the wrist at the Pericardium (P6) acupuncture point to reduce nausea and vomiting. The P6 acupoint lies between the tendons of palmaris longus and flexor carpii radialis muscles four centimetres proximal to the wrist crease (Yang 1993). The mechanism by which P6 acupoint stimulation prevents PONV has not been established. Other acupoints believed to prevent PONV include Shenmen (H7) (Ming 2002) and Shang Wen (CV13) (Somri 2001).

The role and efficacy of P6 acupoint stimulation in the prevention of PONV are unclear. For example, P6 acupoint stimulation significantly reduced the incidence of PONV in some studies (Ho 1996; Rusy 2002; Wang 2002) but not in others (Agarwal 2000; Allen 1994; Barsoum 1990; Shenkman 1999). These inconclusive results may be due to methodological weaknesses of the trials, such as inadequate blinding of patients, investigators or both; inadequate allocation concealment; and insufficient time of P6 acupoint stimulation. One systematic review (Vickers 1996), using a 'vote counting' approach, suggested that acupuncture may not be effective in the prevention of PONV. However, the 'vote counting' approach is not considered an acceptable method of summarizing the result of a systematic review (Petitti 1994).

Our previous systematic review of trials (Lee 1999) published up to 1997 showed no difference between P6 acupoint stimulation and commonly used antiemetic drugs in preventing PONV after surgery. This review also indicated that the technique was more effective than placebo (sham treatment or no treatment) in preventing PONV in adults, but not in children. However, these results in children were questionable as they were based largely on trials in which P6 acupoint stimulation occurred while the central nervous system was depressed by general anaesthesia (White 1999). Another major limitation of our earlier review was that we included both no treatment and sham treatment groups. Therefore, we may have overestimated the treatment effect of P6 acupoint stimulation.

The earlier version of this review: 'The use of nonpharmacologic techniques to prevent postoperative nausea and vomiting: a meta-analysis' (Lee 1999) was published in Anesthesia and Analgesia 1999;88:1362-9.

OBJECTIVES

To assess the prevention of PONV by acupoint stimulation.
We tested the following hypotheses:
1. P6 acupoint stimulation is more effective than sham treatment for the prevention of PONV. 'Sham treatment' was defined as either a device applied in a non-P6 location, or any attempt to imitate (give the illusion of) P6 acupoint stimulation.
2. P6 acupoint stimulation is effective in adults, but not in children.
3. Invasive P6 acupoint stimulation is as effective as noninvasive stimulation. 'Invasive P6 acupoint stimulation' was defined as penetration of the skin at P6 acupoint (manual rotation of acupuncture needle, electrical stimulation of acupuncture needle). 'Noninvasive P6 acupoint stimulation' was defined as techniques that did not require skin penetration at the P6 acupoint (acupressure, transcutaneous electrical stimulation, laser directed at a P6 acupoint).
4. P6 acupoint stimulation effect is larger in trials with unclear allocation concealment than those with adequate allocation concealment.
5. P6 acupoint stimulation is as effective as antiemetic drugs for the prevention of PONV.
We tested the above hypotheses because the National Institutes of Health (NIH) issued a statement that 'acupuncture may be useful as an adjunct treatment or an acceptable alternative or included in a comprehensive management program for many medical conditions.' (NIH 1997).

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

Types of studies

All randomized controlled trials (RCTs) of techniques that stimulated the P6 acupoint compare with either sham treatment, or antiemetic drugs for the prevention of PONV. 'Sham treatment' was defined as a device applied in a non-P6 location or any attempt to imitate (give the illusion of) P6 acupoint stimulation. Therefore, trials that assessed acupressure wristbands without studs placed at P6 acupoint were considered as adequate sham treatment and were included in this review.

Types of participants

All surgical patients without age limitation. The age limits for children were defined by each study.

Types of intervention

Techniques that stimulated the P6 acupoint: acupuncture, electroacupuncture, laser acupuncture, transcutaneous electrical stimulation, acustimulation device and acupressure versus sham treatment or drug therapy for the prevention of PONV. These diverse techniques were considered as one entity in the main analysis, consistent with the concept that stimulating the correct acupuncture point is more important than the nature of the stimulus (Mann 1987). There was no restriction to the duration of P6 acupoint stimulation or when it was applied.

Types of outcome measures

Separate meta-analyses were done for each of the following primary and secondary outcomes. Trials could report more than one primary or secondary outcome.

Primary outcomes

1. Postoperative nausea
2. Postoperative vomiting. This was defined as either retching or vomiting, or both.

Postoperative nausea and vomiting were not combined, as we could not be certain that patients who vomited were also nauseated. If the authors reported several incidences of the outcome measure (e.g. 0 to 6 hours, 6 to 24 hours, 0 to 24 hours), the longest cumulative follow-up data from the end of surgery were used (in this case, 0 to 24 hours).

Secondary outcomes

1. Incidence of patients requiring a rescue antiemetic drug.
2. Description of side effects associated with interventions (P6 acupoint stimulation, antiemetic drugs).

SEARCH STRATEGY FOR IDENTIFICATION OF STUDIES

See: search strategy
We searched the following sources for relevant trials:
The Cochrane Central Register of Controlled Trials (CENTRAL) (***The Cochrane Library***, Issue 1, 2003);
electronic databases: MEDLINE (1966 to January 2003), EMBASE (1988 to January 2003), National Library of Medicine publication list of acupuncture studies (http://www.nlm.nih.gov/pubs/cbm/acupuncture.html);
reference lists of relevant articles, reviews and trials
We did not search for conference proceedings or seek unpublished trials because there is some evidence that grey literature is of lower quality than published literature and that grey literature has not been peer reviewed (McAuley 2000).
The following search strategy was used to identify randomized controlled trials in MEDLINE:
1. RANDOMIZED CONTROLLED TRIAL.
pt.
2. CONTROLLED CLINICAL TRIAL.
pt.
3. RANDOMIZED CONTROLLED TRIALS.
sh.
4. RANDOM ALLOCATION.
sh.

5. DOUBLE BLIND METHOD.
sh.
6. SINGLE BLIND METHOD.
sh.
7. or/#1-#6
8. ANIMAL.
sh not HUMAN.
sh.
9. #7 not #8
10.CLINICAL TRIAL.
pt.
11.exp CLINICAL TRIALS
12.(clin$ adj25 trial$).ti,ab.
13.((singl$ or doubl$ or trebl$ or tripl$) adj25 (blind$ or mask$)).ti,ab.
14.PLACEBOS.
sh.
15.placebo$.ti,ab.
16.random$.ti,ab.
17.RESEARCH DESIGN.
sh.
18.or/#10-#17
19.#18 not #8
20.#19 not #9
21.#9 or #20

The following search strategy was used to identify randomized controlled trials in EMBASE:

1.clinical article/
2.clinical study/
3.clinical trial/
4.controlled study/
5.multicenter study/
6.randomized controlled trial/
7.major clinical study/
8.phase 3 clinical trial
9.phase 4 clinical trial/
10.crossover procedure/
11.double blind procedure/
12.single blind procedure/
13.placebo/
14.or/#1-#13
15.allocat$.ti,ab.
16.assign.
ti,ab.
17.blind$.ti,ab.
18.(clinic$ adj25 (study or trial)).ti,ab.
19.compar$.ti,ab.
20.control$.ti,ab.
21.cross?over.ti,ab.
22.factorial$.ti,ab.
23.follow?up.ti,ab.
24.placebo$.ti,ab.
25.prospectiv$.ti,ab.
26.random$.ti,ab.
27.((singl$ or doubl$ or trebl$ or tripl$) adj25 (blind$ or mask$)).ti,ab
28.trial$.ti,ab.
29.(versus or vs).ti,ab.
30.or/#15-#29
31.#14 or #30
32.human/
33.nonhuman/
34.animal/
35.animal experiment/
36.#33 or #34 or #35
37.#32 and #36
38.#31 not #36
39.#31 and #37
40.#38 or #39

The above strategies were combined with the MeSH and text words 'postoperative complications', 'nausea and vomiting', 'acupuncture', 'acupuncture therapy', 'acupuncture points', 'acupressure', 'transcutaneous electric nerve stimulator' and 'electro-acupuncture'. There was no language restriction.

Excluded from this systematic review was the use of P6 acupoint stimulation in the treatment of established PONV, or in the prevention of intraoperative nausea and vomiting.

METHODS OF THE REVIEW

We selected trials included in the systematic review based upon the search results. We examined all selected trials for duplicate data; where we found duplication, we used the results of the main trial. We extracted data independently, using a standardized data collection form, and we resolved any discrepancies in data extraction by discussion. We assessed the quality of the included trials independently, under open conditions. The quality of allocation concealment was graded as A (adequate), B (unclear), C (inadequate), or D (not done) (Schulz 1995).

We collected data on the type, duration and timing of P6 acupoint stimulation, as well as the type and dose of antiemetic drug prophylaxis. We recorded details of the patient population and type of surgery. We did not consider factors such as the severity of PONV and the number of episodes of vomiting.

We used the DerSimonian and Laird random effects model to combine data, as we expected that the treatment and conditions in these trials would be heterogeneous. This model incorporated both between-study (different treatment effects) and within-study (sampling error) variability (Mosteller 1996). We calculated the pooled relative risk (RR) and 95% confidence interval (95% CI), and analysed heterogeneity using the I2 statistic, the proportion of total variation in the estimates of treatment effect that is due to heterogeneity between studies. We conducted sensitivity analyses to estimate the robustness of results according to allocation

concealment (adequate versus unclear) and control event rate (20%, >20%). We undertook exploratory a priori subgroup analyses, which included trials in adults versus trials in children and trials according to type of P6 acupoint stimulation (invasive versus noninvasive). To test whether the subgroups were different from one another, we tested the interaction using the technique outlined by Altman and Bland (Altman 2003); it would be erroneous to draw conclusions based upon individual subgroup analyses, as these estimates have poor precision. When individual subgroups of different antiemetics were pooled, we made an adjustment to the data in the P6 acupoint stimulation group in Dundee's study (Dundee 1989) to prevent double counting. We performed a statistical test of funnel plot asymmetry, which may indicate the presence of publication bias (Egger 1997), using STATA statistical software (Stata Corporation, College Station, Texas, version 8.2). As Egger's test has low power, asymmetry was regarded as significant when P<0.10. We estimated the number needed to treat (NNT) for different baseline risk for nausea and vomiting (Smeeth 1999) to assess whether P6 acupoint stimulation is worthwhile for individuals. We estimated the 95% confidence intervals around the number needed to treat using the method outlined by Altman (Altman 1998).

DESCRIPTION OF STUDIES

The search identified 43 trials of P6 acupoint stimulation for PONV.

Trials excluded from the review

Seventeen trials were excluded from the review. Please see the table 'Characteristics of excluded studies' for more information.

Trials included in review

Twenty-six trials (n = 3347) met the criteria for inclusion in this review. The trials were conducted between 1986 and 2002. All of the trials but one were published in English (Gieron 1993). The majority of trials involved healthy adults undergoing elective surgery. There were six trials involving children (Lewis 1991; Rusy 2002; Schlager 1998; Shenkman 1999; Wang 2002; Yentis 1992). Most trials involved patients undergoing general anaesthesia. In three trials (Duggal 1998; Harmon 2000; Ho 1996), women undergoing elective Caesarean delivery received spinal anaesthesia.

There was great variability among the trials involving type of surgery; type, timing and duration of the stimulation of the P6 acupoint; and follow-up time for assessing PONV. There were eight types of P6 acupoint stimulation: manual rotation of needles (Dundee 1986; Dundee 1989; Yentis 1992), infiltration of dextrose (Wang 2002; Yang 1993), semipermanent needles (Andrzejowski 1996), electrical stimulation of needles (Dundee 1989; Ho 1989; Rusy 2002), transcutaneous electrical nerve stimulator (Fassoulaki 1993; Ho 1989), laser stimulation (Schlager 1998), acustimulation device (White 2002; Zarate 2001) and acupressure (Agarwal 2000; Agarwal 2002; Alkaissi 1999; Alkaissi 2002; Allen 1994; Barsoum 1990; Duggal 1998; Ferrara-Love 1996; Gieron 1993; Harmon 1999; Harmon 2000; Ho 1996; Lewis 1991). One trial (Shenkman 1999) used both acupressure and acupuncture.

Antiemetics, as a comparison group, included metoclopramide or cyclizine (Dundee 1989), prochlorperazine (Barsoum 1990; Ho 1989), droperidol (Wang 2002; Yang 1993; Yentis 1992) and ondansetron (Agarwal 2002; White 2002).

METHODOLOGICAL QUALITY

None of the 26 trials included reported adequate allocation concealment. In 25 trials the allocation concealment was unclear, and in one trial (Ferrara-Love 1996), it was inadequate. The quality of blinding was also variable; although outcome assessors were blinded to treatment groups in most trials, the effectiveness of blinding was questionable in several trials (Alkaissi 2002; Dundee 1986; Dundee 1989; Fassoulaki 1993; Ferrara-Love 1996; Gieron 1993; Harmon 2000; Schlager 1998; Shenkman 1999; Wang 2002).

RESULTS

P6 acupoint stimulation versus sham treatment

Nausea

Sixteen trials (n = 1826) examined P6 acupoint stimulation for the prevention of nausea. Although P6 acupoint stimulation reduced the risk of nausea (RR 0.72, 95% CI 0.59 to 0.89), there was moderate heterogeneity among trials (I2 = 51.5%). There was no evidence of bias in the funnel plot (Egger's test coefficient -1.01±0.63(SE); t = -1.62 P = 0.13, Figure 01). The estimated number needed to treat for different baseline risk of nausea is shown in the additional table (Table 01).

In children (comparison 01.01.02), the risk of nausea was lower in the P6 acupoint stimulation group than in the sham treatment group (RR 0.63, 95% CI 0.51 to 0.80) and there was no heterogeneity among these trials (I2 = 0%). Although there was moderate heterogeneity (I2 = 51.0%) among the trials in adults (comparison 01.01.03), the risk of nausea was lower in the P6 acupoint stimulation group than in the sham treatment group (RR 0.75, 95% CI 0.59 to 0.96). A test of interaction showed that there was no difference in treatment effect among trials conducted in children and adults (z statistic -1.03, P = 0.30).

Trials that examined invasive P6 acupoint stimulation (comparison 01.01.04) appeared to reduce the risk of nausea (RR 0.63, 95% CI 0.45 to 0.89), but there was moderate heterogeneity among the trials (I2 = 50.5%). A test of interaction showed that there was no difference in treatment effect among invasive and noninvasive (comparison 01.01.05) P6 acupoint stimulation trials (z statistic -0.89, P = 0.37). There was a significant reduction in the risk of nausea among trials with a control event rate of more than 20% (comparison 01.01.07) (RR 0.71, 95% CI 0.56 to 0.89) but there

was severe heterogeneity among these trials (I2 = 61.0%). A test of interaction showed that there was no difference in treatment effect according to the control event rates (z statistic 0.67, P = 0.50 respectively).

Vomiting

There were 20 trials (n = 2187) that examined P6 acupoint stimulation for the prevention of vomiting. Although there was severe heterogeneity among these trials (I2 = 65.0%), results indicate that P6 acupoint stimulation reduced the risk of vomiting (RR 0.71, 95% CI 0.56 to 0.91). There was evidence of bias in the funnel plot (Egger's test coefficient -1.01±0.49(SE); t = -2.04 P = 0.06, Figure 02). The estimated number needed to treat for different baseline risk of vomiting is shown in the additional table (Table 01).

There was severe heterogeneity (I2 = 86.1%) among the trials in children (comparison 01.02.02), which may be related to when vomiting was measured. For example, one trial (Wang 2002) measured vomiting up to the end of the recovery room stay, while the other three trials (Lewis 1991; Rusy 2002; Shenkman 1999) measured vomiting up to 24 hours after surgery. There was a significant reduction in the risk of vomiting in adults (comparison 01.02.03) (RR 0.70, 95% CI 0.52 to 0.94). A test of interaction showed that there was no difference in effects between trials conducted in children and adults (z statistic 0.11, P = 0.92).

As one trial (Shenkman 1999) used both acupressure and acupuncture, it was not included in the subgroup analyses (invasive versus noninvasive). There was severe heterogeneity (I2 = 70.8%) among the trials that used noninvasive P6 acupoint stimulation (comparison 01.02.05), with a reduction in the risk of vomiting (RR 0.68, 95% CI 0.48 to 0.95). However, there was no difference in the effect between invasive and noninvasive methods (z statistic -0.10, P = 0.92). There was a significant reduction in the risk of vomiting among trials with control event rate of more than 20% (comparison 01.02.07) (RR 0.67, 95% CI 0.50 to 0.88) but there was severe heterogeneity among these trials (I2 = 76.2%). There was no difference in the treatment effect according the control event rate (z statistic 1.06, P = 0.29).

Rescue antiemetic

The type of antiemetic drug used for rescue was not specified in several trials (Alkaissi 2002; Duggal 1998; Ferrara-Love 1996). There was only one trial (Schlager 1998) where P6 acupoint stimulation was associated with fewer requirements for rescue antiemetics (RR 0.14, 95% CI 0.04 to 0.55). Although three patients were excluded from one trial (Fassoulaki 1993) because of persistent vomiting that required metoclopramide, the data has been included in this systematic review. There was no difference in the incidence of the need for rescue droperidol, metoclopramide, ondansetron, or prochlorperazine between the groups. However, when all types of individual rescue antiemetic drugs were pooled, there was moderate heterogeneity (I2 = 47.8%) among the trials. There was a significant reduction in the incidence of the need for rescue antiemetics between the P6 acupoint stimulation and the sham treatment group (RR 0.76, 95% CI 0.58 to 1.00).

Side effects

Overall, the side effects associated with P6 acupoint stimulation were minor. No side effects were observed for patients receiving acupuncture (Dundee 1986; Dundee 1989) or acupressure in several trials (Agarwal 2000; Agarwal 2002; Harmon 1999; Ho 1996; Lewis 1991). Although no side effects were associated with an acustimulation device (White 2002), another trial reported mild cutaneous irritation (Zarate 2001). Pain was reported at the acupuncture site in one trial (Yang 1993). There was no significant difference in the incidence of redness and irritation at the puncture site between P6 acupoint stimulation and sham treatment groups (Shenkman 1999). Patients complained of feeling tired and sleepy during electro-acupuncture stimulation (Ho 1989). Two trials (Alkaissi 2002; Duggal 1998) reported that acupressure bands felt uncomfortable, produced red indentation or caused itching, headache and dizziness, swollen wrists and blistering at the site of the button.

P6 acupoint stimulation versus antiemetic

Nausea

There were four trials comparing antiemetics and P6 acupoint stimulation to prevent postoperative nausea (Agarwal 2002; Dundee 1989; Wang 2002; White 2002). The risk of nausea was similar in the P6 acupoint stimulation and ondansetron (Agarwal 2002; White 2002), metoclopramide (Dundee 1989), cyclizine (Dundee 1989) and droperidol groups (Wang 2002). When these subgroups of different antiemetics were pooled, there was a more significant reduction in the risk of nausea in the P6 acupoint stimulation group than in the antiemetic group (RR 0.70, 95% CI 0.50 to 0.98). These trials were homogeneous (I2 = 0%). The estimated number needed to treat for different baseline risk of nausea is shown in the additional table (Table 02). There was no evidence of bias in the funnel plot (Egger's test coefficient -0.69±0.99(SE); t = -0.70 P = 0.54).

Vomiting

Eight trials were included which compared antiemetics and P6 acupoint stimulation to prevent postoperative vomiting (Agarwal 2002; Barsoum 1990; Dundee 1989; Ho 1989; Wang 2002; White 2002; Yang 1993; Yentis 1992). The risk of vomiting was similar in the P6 acupoint stimulation and ondansetron (Agarwal 2002; White 2002), metoclopramide (Dundee 1989), cyclizine (Dundee 1989) and prochlorperazine (Barsoum 1990; Ho 1989) groups. There was no heterogeneity among the droperidol trials (I2 = 0%) and there was no difference in the risk of vomiting between the groups (RR 0.89, 95% CI 0.57 to 1.41). When these subgroups of different antiemetics were pooled, the trials were homogeneous (I2 = 0%). There was no difference in the risk of vomiting between the P6 acupoint stimulation group and the antiemetic group (RR 0.92, 95% CI 0.65 to 1.29). The estimated number needed to treat for different baseline risk of vomiting is shown in the additional table (Table 02), with confidence intervals containing the number needed to benefit (NNTB) and the number needed to

harm (NNTH). There was no evidence of bias in the funnel plot (Egger's test coefficient -0.45±0.83(SE); t = -0.55 P = 0.60).

Rescue antiemetic

No patients in one trial (Agarwal 2002) required rescue antiemetics. The incidence of rescue antiemetic (dimenhydrinate) was collected, but not reported, in another trial (Yentis 1992). The incidence of rescue antiemetics was similar among P6 acupoint stimulation groups and individual antiemetic groups (Agarwal 2002; Wang 2002; White 2002). When the individual antiemetic groups were pooled, the trials were homogeneous (I2 = 0%). There was no difference in the incidence of rescue antiemetics between the P6 acupoint stimulation and antiemetic groups (RR 0.78, 95% CI 0.54 to 1.14).

Side effects

No side effects were observed for people receiving ondansetron (Agarwal 2002). Restlessness was more frequent in the droperidol group than in the acupuncture group (Yentis 1992).

DISCUSSION

This systematic review has shown that P6 acupoint stimulation is effective in reducing the risk of PONV compared to sham treatment, although there is considerable heterogeneity among the trials examined. The effect of P6 acupoint stimulation for the prevention of postoperative nausea (RR 0.72, 95% CI 0.59 to 0.89) is similar to the prevention of vomiting (RR 0.71, 95% CI 0.56 to 0.91). The effect of P6 acupoint stimulation between children and adults, type of P6 acupoint stimulation (invasive versus non-invasive) and different control event rates appears to be similar. Therefore, the reasons for moderate heterogeneity among the trials are not clear. There is no difference in the requirements for rescue droperidol, metoclopramide, ondansetron and prochlorperazine between the P6 acupoint stimulation and sham groups, but this may be due to the limited number of studies within each type of rescue antiemetic drug used. However, when these different rescue antiemetics were pooled, we found a more significant reduction in the requirement for rescue antiemetic in the P6 acupoint stimulation group than in the sham group. Therefore, there may be economic savings (antiemetic drug cost, length of stay in hospital) associated with P6 acupoint stimulation.

The quality of the included trials was fair. Although none of 26 trials used adequate allocation concealment techniques, the sequence of randomization was adequate in many trials (Agarwal 2000; Agarwal 2002; Alkaissi 2002; Andrzejowski 1996; Barsoum 1990; Duggal 1998; Harmon 1999; Ho 1996; Rusy 2002; Wang 2002; White 2002; Zarate 2001). As it was not clear whether sealed opaque envelopes were used in four trials (Alkaissi 2002; Andrzejowski 1996; Harmon 1999; Ho 1996), these trials were graded as 'unclear allocation concealment'. Adequate blinding of outcome assessors, investigators and patients was questionable in a number of trials. A difficulty in P6 acupoint stimulation studies is the use of adequate sham treatment. There were many different types of sham treatment but for the purposes of this systematic review, all were considered as one entity. There may be subtle differences between inactive ReliefBand (White 2002; Zarate 2001) and SeaBands with studs removed (Barsoum 1990; Duggal 1998; Ferrara-Love 1996) placed over the P6 acupoint.

The funnel plots for nausea and vomiting showed some evidence of bias, despite a thorough search and exclusion of trials with a 'no treatment' control group. Therefore, the summary estimates from this systematic review may be an over-estimate. Publication bias may be common in RCTs of traditional Chinese medicine (Tang 1999).

There was no evidence that P6 acupoint stimulation reduced the risk of PONV compared to various types of prophylactic antiemetics. It is unclear whether there was 'no evidence of difference' or 'evidence of no difference', given that there was only a small number of trials, with a small number of participants, comparing P6 acupoint stimulation to various types of antiemetics. More P6 acupoint stimulation versus ondansetron or droperidol trials are needed before a firm conclusion can be made about the comparative effect of P6 acupoint stimulation against these antiemetics. However, when the subgroups of different antiemetics were pooled, we found a greater reduction in the risk of nausea (but not vomiting) in the P6 acupoint stimulation group than in the antiemetic group. As these trials were homogeneous, it is reasonable to assume that P6 acupoint stimulation confers some benefit to preventing PONV when compared to prophylactic antiemetic management.

AUTHORS' CONCLUSIONS

Implications for practice

The results from the number needed to treat table (Table 01) suggest that P6 acupoint stimulation may be more worthwhile for the prevention of PONV in patients with a high baseline risk who are not given prophylactic antiemetics. No major side effects were associated with P6 acupoint stimulation. While the number of trials comparing P6 acupoint stimulation to antiemetic drugs is small, the risk of nausea (but not vomiting) is lower in patients receiving P6 acupoint stimulation than in patients given prophylactic antiemetic treatment. The number needed to treat table (Table 02) suggests that P6 acupoint stimulation may be worthwhile for preventing nausea in patients with a high baseline risk who might have otherwise been given prophylactic antiemetics.

Implications for research

This systematic review did not review the combined effect of P6 acupoint stimulation administered with an antiemetic. A recent study (White 2002) suggests that patients receiving acustimulation and ondansetron in combination have a lower risk of PONV and a higher quality of recovery than those receiving ondansetron alone. Also, studies that compare P6 acupoint stimulation to multidrug

prophylactic regimes are required. Future studies are required to assess the optimal timing of P6 acupoint stimulation (preoperative versus intraoperative versus postoperative) and whether bilateral stimulation at the P6 acupoint is more effective than unilateral stimulation. More importantly, trials should use adequate allocation concealment and include clinically relevant outcomes, such as length of stay, to draw meaningful conclusions.

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POTENTIAL CONFLICT OF INTEREST

None known

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* ***Indicates the major publication for the study***

TABLES

Characteristics of included studies

Study	***Agarwal 2000***
Methods	Patients assigned to groups by a computer-generated table of random numbers. All acupressure wristbands were covered with gauze and tape. Outcome assessor blinded to treatment groups.
Participants	200 patients undergoing endoscopic urological surgery. Exclusion: patient refusal to participate in study, previous history of PONV and motion sickness, impaired renal function with increased urea and creatinine concentrations, diabetes mellitus, obesity, patients receiving antiemetic medication, histamine H2-receptor antagonist within 72 hours of surgery. No patient withdrew from the study.
Interventions	Acupressure wristband placed at P6 points on both forearms applied 30 min before induction of anaesthesia and removed after 6 hours following surgery. Sham group was the spherical bead of acupressure wristbands placed on posterior surface applied 30 min before induction of anaesthesia and removed 6 hours after surgery.
Outcomes	Nausea (0-24h), vomiting (0-24h), side effects of acupressure, incidence of rescue antiemetics given.
Notes	Rescue antiemetic was ondansetron 4 mg IV. No side effects or complications noted in either group.
Allocation concealment	B

Study	***Agarwal 2002***
Methods	Patients assigned using a table of random numbers. Outcome assessor blinded to treatment groups. Acupressure and sham group received normal saline IV before induction to maintain blinding of the treatment groups.
Participants	150 adults undergoing laparoscopic cholecystectomy. Exclusion: patient refusal to participate in study, previous history of PONV and motion sickness, impaired renal function with increased urea and creatinine concentrations, diabetes mellitus, obesity, patients receiving antiemetic medication, histamine H2-receptor antagonist within 72 hours of surgery.
Interventions	Acupressure wristband placed at P6 points on both forearms applied 30 min before induction of anaesthesia and removed after 6 hours following surgery (plus normal saline 1 mL IV just before induction of anaesthesia). Sham group was the spherical bead of acupressure wristbands placed on posterior surface applied 30 min before induction of anaesthesia and removed 6 hours after surgery (plus normal saline 1 mL IV just before induction of anaesthesia). Antiemetic group was ondansetron 4 mg IV just before induction of anaesthesia (plus sham treatment outlined above)
Outcomes	Nausea (0-24h), vomiting (0-24h), incidence of rescue antiemetic.
Notes	Rescue antiemetic was ondansetron 4 mg IV if patient vomited more than once. No side effects or complications noted in any of the groups. Data for outcome (0-24h) obtained by correspondence with author.
Allocation concealment	B

Characteristics of included studies *(Continued)*

Study	***Alkaissi 1999***
Methods	Method of allocation concealment not given. Patients were asked to record nausea and vomiting during their stay in hospital and after discharge. Nurses who asked the patients about nausea and administered antiemetics on the postoperative ward were not aware of treatment allocation or where the P6 acupoint was located.
Participants	60 women undergoing day case minor gynaecological surgery. Exclusion: patients undergoing local anaesthesia and those given prophylactic antiemetic during anaesthesia (n=10, replaced by randomizing another 10 patients at the end of the study).
Interventions	Acupressure wristband placed at P6 point on both forearms. Applied before surgery and left on for 24 hours. Draped with a dressing during the stay in the hospital. Sham acupressure applied to dorsal side of forearms. Applied before surgery and left on for 24 hours. Draped with a dressing during the stay in the hospital. Reference group were informed and anaesthetised in the same way as the other two groups.
Outcomes	Nausea (0-24h), vomiting (0-24h), incidence of rescue antiemetic given.
Notes	Rescue antiemetics were metoclopramide 10 mg IV, if not effective, then given droperidol 1.25 mg IV. Reference group received no treatment and was not included in data-analysis.
Allocation concealment	B

Study	***Alkaissi 2002***
Methods	Patients randomized by sealed envelope (not opaque). Patients were asked to record nausea and vomiting. Multicentre trial. Wrists were wrapped with dressing to maintain blinding (but patients may have unwrapped the dressing).
Participants	410 women undergoing elective gynaecological surgery. No exclusion criteria specified. Thirty patients were withdrawn because they were given local anaesthesia (n=12) or an antiemetic was given without the criteria for treatment of PONV being met (n=14), malignant hyperthermia (n=1), allergy to latex (n=2) and could not read Swedish (n=1). These 30 patients were replaced by another 30 at the end of the study period.
Interventions	Acupressure wristband placed on P6 point on both forearms just before start of anaesthesia, left on for 24 hours. Sham group included acupressure wristbands at non-acupoint on both forearms just before start of anaesthesia, left on for 24 hours. Reference group received no prophylactic treatment and was not blinded.
Outcomes	Nausea (0-24h), vomiting (0-24h), side effects of acupressure, incidence of antiemetic rescue (type of drug not described).
Notes	Reference group received no treatment and was not included in data-analysis. Adverse effects: Wristbands felt uncomfortable, produced red indentation or caused itching, headache and dizziness, or wrists hurt and tightness of wristband caused swelling or deep marks or blistering at site of stud.
Allocation concealment	B

Study	***Allen 1994***
Methods	Method of allocation concealment not given. Outcome assessor was anaesthetist. Blinding not mentioned. No patient withdrew from study.
Participants	46 women undergoing gynaecological surgery. Exclusions: previous exposure to elasticized wristbands for the prevention of motion sickness.
Interventions	Acupressure wristband placed on P6 point on dominant arm before premedication (90 min before surgery). Duration of treatment not given. Sham acupressure wristband placed on dorsum of dominant wrist before premedication. Duration of treatment not given.
Outcomes	Nausea (0-24h), vomiting (0-24h)

Characteristics of included studies *(Continued)*

Notes	Rescue antiemetic was prochlorperazine 12.5 mg IM 4 hourly when necessary. More than one dose of prochlorperazine data given (not included in data analysis).
Allocation concealment	B

Study	***Andrzejowski 1996***
Methods	Randomization by sealed envelope (not opaque). Patients asked to record nausea and vomiting.
Participants	36 women undergoing total abdominal hysterectomy. Exclusions: metal or elastoplast allergy, anticoagulant therapy, local skin disease at P6 acupoint or sham point, or chronic treatment with antiemetics.
Interventions	Semipermanent acupuncture needle inserted at P6 acupoint on both wrists 20 min before induction, left in place till second postoperative day. Sham semipermanent acupuncture needle inserted in sham point 20 min before induction, left in place till second postoperative day.
Outcomes	Nausea (0-8h), vomiting (0-8h), incidence of antiemetic rescue.
Notes	Antiemetic rescue was prochlorperazine 12.5 mg IM when necessary. No side effects reported.
Allocation concealment	B

Study	***Barsoum 1990***
Methods	Randomization by 'envelope system'. No details about whether outcome assessor was blinded or not. Active and inactive acupressure wristbands were worn in the recovery room until discharge from hospital or for seven days if that was sooner.
Participants	162 patients undergoing general surgery. Ten patients withdrew because of language or age difficulty with completing analogue score, premature removal of wristbands and incomplete follow-up data.
Interventions	Acupressure wristbands placed on P6 acupoint on both wrists in the recovery room. Sham acupressure wristbands (no studs) were applied to both wrists in the recovery room and antiemetics given only if clinically required. Antiemetic group was given prochlorperazine 12.5 mg IM with each postoperative opiate injection and when clinically required, and wore an acupressure band without stud on both wrists in the recovery room.
Outcomes	Vomiting (0-24h), incidence of rescue antiemetic (prochlorperazine).
Notes	Vomiting on postoperative day 2 and 3 also reported.
Allocation concealment	B

Study	***Duggal 1998***
Methods	A table of random numbers was used to allocate patients treatment groups. Patient, anaesthetist and investigators were unaware of treatment groups during the study. Patients recorded outcome measures on a questionnaire.
Participants	263 patients undergoing spinal anaesthesia for elective Caesarean delivery. Excluded: patients with a history of hyperemesis gravidarum or if they had received antiemetic medication during the 48h before surgery. Eight women excluded for failing to wear wristbands for 10 hours, three had received prophylactic antiemetics and eight were not given standard combination of intrathecal drugs (total 19 withdrawals).
Interventions	Acupressure wristbands were applied to both wrists just before induction of spinal anaesthesia and worn for 10 hours. Sham acupressure wristbands were applied at P6 acupoint (but stud missing) on both wrists just before induction of spinal anaesthesia and worn for 10 hours.
Outcomes	Nausea (0-10h), vomiting (0-10h), incidence of antiemetic rescue (type of drug not given), side effects of acupressure .
Notes	Adverse effects of acupressure wristbands: tightness, swollen hands, problems with infusion, itching wrists. Intraoperative nausea and vomiting reported.
Allocation concealment	B

Characteristics of included studies *(Continued)*

Study	***Dundee 1986***
Methods	Method of allocation concealment not given. Outcome assessor was blinded to treatment groups.
Participants	75 women undergoing minor gynaecological surgery.
Interventions	Group 1: Acupuncture at P6 acupoint with 5 min manual stimulation (1.2 cm 30 gauge needle) after premedication with nalbuphine 10 mg Group 2: Sham acupuncture at a dummy point on lateral elbow crease with 5 min manual stimulation (1.2 cm 30 gauge needle) after premedication with nalbuphine 10 mg. Group 3: No further treatment after premedication with nalbuphine 10 mg.
Outcomes	Nausea (0-6h), vomiting (0-6h), side effects of treatment.
Notes	No side effects noted in either group. Group 3 data were excluded from data-analysis. Presence or absence of needle marks and its location may have been observed by the outcome assessor.
Allocation concealment	B

Study	***Dundee 1989***
Methods	Method of allocation concealment not given. Outcome assessor was blinded to treatment group, except where the patient pointed to the P6 acupoint site.
Participants	155 women undergoing minor gynaecological surgery.
Interventions	Acupuncture at P6 acupoint with 5 min manual stimulation after premedication. Electroacupuncture at P6 acupoint for 5 min after premedication. Antiemetic group 1 had cyclizine 50 mg IM after premedication. Antiemetic group 2 had metoclopramide 10 mg IM after premedication. Reference group had no treatment.
Outcomes	Nausea (0-6h), vomiting (0-6h), side effects of treatment.
Notes	For data analysis purposes, manual acupuncture and electro-acupuncture were combined. Reference group received no treatment and was not included in data-analysis. This paper reports both controlled and uncontrolled studies of P6 stimulation. Used original data from Dundee JW, Fitzpatrick KTJ, Ghaly RG. Is there a role for acupuncture in the treatment of postoperative nausea and vomiting? Anesthesiology 1987; 67: 3A P165. This trial appears to be a duplicate of a previous published study: Ghaly RG, Fitzpatrick KTJ, Dundee JW. Antiemetic studies with traditional Chinese acupuncture-a comparison of manual needling with electrical stimulation and commonly used antiemetics. Anaesthesia 1987; 42: 1108-10 (note that metoclopramide group was not included in this trial, but the results of other groups are the same).
Allocation concealment	B

Study	***Fassoulaki 1993***
Methods	Method of allocation concealment not given. Transcutaneous electrical nerve stimulator, active or inactive, was covered with dark plastic bags. Outcome assessor was blinded to treatment allocation.
Participants	106 women undergoing abdominal hysterectomy. Three patients in the sham group were excluded because they were given metoclopramide in the postoperative period for persistent vomiting (but this data is included for incidence of the need for rescue antiemetic analysis).
Interventions	Transcutaneous electrical nerve stimulation on the P6 acupoint was applied 30-45 min before induction and continued for 6 hours postoperatively. Sham group was treated the same way but with the electrical stimulator turned off.
Outcomes	Vomiting (0-2h) without antiemetic rescue, incidence of the rescue antiemetic (metoclopramide).
Notes	Potential bias if outcome assessor removed plastic bag covering the stimulator. Reported vomiting 2-4h, 4-6h, 6-8h intervals. No data on vomiting (0-8h).
Allocation concealment	B

Characteristics of included studies *(Continued)*

Study	***Ferrara-Love 1996***
Methods	Allocation was done by birth date with even numbered months and days assigned to the treatment group, odd months and days assigned to the sham acupressure group and combinations of even/odd months and days assigned to the no treatment group. Recovery room nurses were blinded to patients with acupressure and sham acupressure wristbands.
Participants	136 adults undergoing orthopaedic, general, plastic and 'other' surgery. Forty-six patients excluded after randomization for failure to meet inclusion criteria.
Interventions	Group 1: Acupressure wristbands placed on P6 acupoint during surgery until hospital discharge. Group 2: Sham acupressure wristbands without studs placed on P6 acupoint during surgery until hospital discharge. Group 3: Reference group had no acupressure treatment.
Outcomes	Nausea in the operating room after surgery, incidence of rescue antiemetics in the operating room
Notes	No treatment group excluded from data analysis. No cumulative outcome data. Whether outcome assessor was blinded to treatment groups is questionable when nausea occurred in the operating room after surgery.
Allocation concealment	C

Study	***Gieron 1993***
Methods	Method of allocation concealment not given. Outcome assessor knew what treatment group the patient belonged to.
Participants	90 women undergoing gynaecological operations (6-8h).
Interventions	Group 1: Acupressure was carried out by fastening small metal bullets at the P6 acupoint to each wrist by an elastic bandage on the morning of the operation and left on for 24h Group 2: Sham acupressure carried out by applying elastic bandage to P6 acupoint on the morning of the operation and left on for 24h Group 3: No treatment.
Outcomes	Nausea (0-6h), vomiting (0-6h), incidence of rescue antiemetic (metoclopramide) given.
Notes	Blinding was probably inadequate. No treatment data was excluded from analysis. Also reported separate incidence of nausea and vomiting (0-1h) and (6-24h).
Allocation concealment	B

Study	***Harmon 1999***
Methods	Randomization was conducted by computer and the code was sealed (not opaque) until arrival of patient in the operating theatre. Outcome assessor was blinded to treatment groups.
Participants	104 women undergoing laparoscopy and dye investigation. Exclusions: obesity, diabetes mellitus and previous history of PONV.
Interventions	Acupressure on P6 acupoint on right wrist, applied immediately before induction for 20 min, removed before end of surgery. Placebo acupressure on non-acupoint site, applied before induction for 20 min and removed before end of surgery.
Outcomes	Nausea (0-24h), vomiting (0-24h), incidence of rescue antiemetics given.
Notes	Rescue antiemetic was ondansetron 4 mg IV and prochlorperazine 12.5 mg IM. No side effects in either group noted. Some patients did not have outcome data.
Allocation concealment	B

Study	***Harmon 2000***

Characteristics of included studies *(Continued)*

Methods	Method of allocation concealment was not given. Acupressure wristbands and placebo acupressure wristbands were covered with surgical drapes to prevent anaesthetist from identifying which group the patient was allocated to. Patients might have guessed which group they were in as there was no attempt to conceal the wristband. Authors claimed that the outcome assessor was blinded to treatment group but this is questionable.
Participants	94 healthy women (18 to 40 years) undergoing elective Caesarean section. Excluded: previous history of PONV, nausea and vomiting in previous 24 hours, obesity (body mass index > 35), diabetes mellitus or previous experience of acupuncture or acupressure.
Interventions	Acupressure on P6 acupoint on right wrist, applied 5 min before administration of spinal anaesthesia, removed just before assessment 6 hours after discharge to the ward. Placebo acupressure on non-acupoint site, applied 5 min before administration of spinal anaesthesia, removed just before assessment 6 hours after discharge to the ward.
Outcomes	Nausea (0-24h), vomiting (0-24h).
Notes	Reported separate incidence of intraoperative nausea and vomiting. Rescue antiemetic was ondansetron 4 mg IV during operations, or cyclizine 50 mg IM 8 hourly after operations (no data for incidence of rescue cyclizine use). Side effects not reported.
Allocation concealment	B

Study	***Ho 1989***
Methods	Method of allocation concealment not given. No details about whether the outcome assessor was blinded to treatment groups or not.
Participants	100 women undergoing laparoscopy.
Interventions	Group 1: Electro-acupuncture applied at P6 acupoint on right wrist for 15 min in the recovery room. Group 2: Transcutaneous electrical nerve stimulation at P6 acupoint on right wrist for 15 min in the recovery room Group 3: Antiemetic group was given prochlorperazine 5 mg IV. Group 4: No treatment
Outcomes	Vomiting (0-3h), side effects of treatment groups.
Notes	Reference group received no treatment and was not included in data-analysis. Group 1 and 2 were combined for data analysis. Side effect of electro-acupuncture were sleepiness and feeling tired.
Allocation concealment	B

Study	***Ho 1996***
Methods	Randomization conducted by computer, with each code sealed in an envelope (not opaque) to be opened before induction of spinal anaesthesia. Outcome assessor was blinded to treatment groups.
Participants	60 women receiving epidural morphine for post-Caesarean section pain relief. Excluded: previous carpal tunnel syndrome, or those who had experienced nausea or vomiting within 24 h before Caesarean section.
Interventions	Group 1: Acupressure wristbands on P6 acupoint on both wrists before administration of spinal anaesthesia. Worn for 48 hours. Group 2: Sham acupressure wristbands on both wrists but plastic button was blunted in order not to exert pressure on P6 acupoint. Worn for 48 hours.
Outcomes	Nausea (0-48h), vomiting (0-48h), incidence of rescue antiemetic, side effects of acupressure wristbands.
Notes	Rescue antiemetic was metoclopramide. No side effects were noted.
Allocation concealment	B

Study	***Lewis 1991***
Methods	Method of allocation concealment was not given. Outcome assessor was blinded.
Participants	66 children undergoing strabismus correction surgery. Excluded: children with anatomical or neurological abnormalities of the upper limbs. Two children lost to follow-up.

Characteristics of included studies *(Continued)*

Interventions	Group 1: Acupressure wristbands placed on P6 acupoints 1 hour before surgery and worn until discharge from hospital. Group 2: Sham acupressure wristbands without studs placed on P6 acupoints 1 hour before surgery and worn until discharge from hospital.
Outcomes	Vomiting (0-24h), incidence of rescue antiemetic, side effects.
Notes	Both types of wristbands were identical unless turned inside out. Rescue antiemetic was droperidol 0.02 mg/kg IV for vomiting.
Allocation concealment	B

Study	***Rusy 2002***
Methods	Randomized block design procedure was used. Arms were covered with full-length soft restraints so the needle positions could not be seen. Recovery room nurses were blinded to treatment groups. Patients were asked to record nausea and vomiting over 24h after discharge from hospital.
Participants	121 children (4-18 years) undergoing tonsillectomy with or without adenoidectomy. Exclusions: presence of skin lesions near acupuncture sites, previous and severe PONV, chronic history of nausea and vomiting. One child withdrew after enrolment.
Interventions	Electro-acupuncture at P6 for 20 min after patient was awake. Sham electro-acupuncture at P2 for 20 min after patient was awake. Sham reference group had no needles inserted. Insulated wires were attached to insides of arm and stimulation box was activated to maintain blinding.
Outcomes	Vomiting (0-24h), nausea (0-24h), incidence of rescue antiemetics given.
Notes	Rescue antiemetics were ondansetron and droperidol IV. Sham electro-acupuncture and Sham reference group data were combined.
Allocation concealment	B

Study	***Schlager 1998***
Methods	Method of allocation concealment not given. Neither children nor parents were able to tell if the laser was active. Incidence of vomiting recorded by nursing staff in the recovery room and on the ward.
Participants	40 children (3 to 12 years) undergoing strabismus surgery. Excluded: children with gastric or intestinal disease, emesis and vomiting in the previous week, and those who received any medical therapy immediately before surgery. No child withdrew from study.
Interventions	Low-level laser stimulation performed on each P6 acupoints over 30 seconds, 15 minutes before induction of anaesthesia and 15 minutes after arriving in the recovery room. Sham laser stimulation held on P6 acupoints but laser beam not activated, 15 minutes before induction of anaesthesia and 15 minutes after arriving in the recovery room.
Outcomes	Vomiting (0-24h), incidence of rescue antiemetic
Notes	Rescue antiemetic was dimenhydrinate suppositories 50 mg. Nurses in the recovery room may not have been blinded to treatment groups. Vomiting (0-2h, 0-6h) also recorded in the paper.
Allocation concealment	B

Study	***Shenkman 1999***
Methods	Method of allocation concealment not given. Recovery room nurses and ward nurses were blinded to treatment groups. P6 acupoints and sham points on all patients were covered with opaque adhesive tape.
Participants	100 children (2-12 years) undergoing tonsillectomy. Exclusion: congenital heart disease or significant pulmonary disease, predisposition for emesis or actual emesis in the 24 hours before surgery, use of medications with antiemetic effects within the 24 hours before surgery, infection over an acupuncture point, need for postoperative intubation for more than 1 hour, and severe obstructive sleep apnea.

Interventions	Group 1: Acupressure wristband on P6 acupoints on both wrists applied before premedication. Immediately after induction of anaesthesia, wristbands were removed and acupuncture needles were inserted at P6 acupoint on both wrists, left in place until next day. Needles were secured with a strip of tape. Group 2: Acupressure wristbands applied to sham point on both arms before premedication. Immediately after induction of anaesthesia, wristbands were removed and acupuncture needles were applied to sham point on both arms, left in place until next day. Needles were secured with a strip of tape.
Outcomes	Vomiting (0-24h), incidence of rescue antiemetics given, side effects of acupressure/acupuncture.
Notes	Rescue antiemetic was ondansetron IV if two or more emetic episodes occurred. Combination of acupressure and acupuncture treatment effect was not analysed in subgroup analysis (invasive versus noninvasive). Proportion of acupuncture site redness and irritation was similar in both groups. Potential unblinding of treatment groups if dressing was removed to see location of needle marks.
Allocation concealment	B

Study	***Wang 2002***
Methods	Yoking randomization procedure used. Children, parents, surgeons, anaesthetists, Recovery room nurses and research assistant were blinded to treatment groups. Small adhesive bandages applied to P6 acupoints on all subjects.
Participants	190 children (7-16 years) undergoing general anaesthesia and outpatient surgical procedures. Exclusions: ASA physical status higher than II and subjects with a history of developmental delay or prematurity. Three children were excluded from study because of major study protocol violations.
Interventions	Group 1: After induction, intravenous saline was given. Acupuncture at P6 acupoints on both arms was performed before end of surgery. Injection of 0.2 mL of 50% dextrose using a B-D 1 mL tuberculin syringe with a 25-gauge needle at a depth of 5 to 7 mm from skin. Group 2: After induction, droperidol 10 ug/kg IV was given. Superficial skin prick at the P6 acupoint was performed before end of surgery. Group 3: After induction, intravenous saline was given. Sham point acupuncture at the dorsum of arms was performed before end of surgery. Injection of 0.2 mL of 50% dextrose using a B-D 1 mL tuberculin syringe with a 25-gauge needle at a depth of 5 to 7 mm from skin. Group 4: After induction, intravenous saline was given. Superficial skin prick at the P6 acupoint was performed before end of surgery.
Outcomes	Nausea (0-recovery room), vomiting (0-recovery room), incidence of rescue antiemetic
Notes	Rescue antiemetic was ondansetron IV 0.1-4 mg/kg. Group 3 and 4 were combined and considered as a sham group. No puncture site redness or irritation noted in any of the groups. Patients in the Group 3 may have had needle marks which would have been easily observed in the postoperative period. Late outcomes (discharge to first day after surgery) also reported. No data on outcomes (0-24h) according to author.
Allocation concealment	B

Study	***White 2002***
Methods	Randomization by computer generated random number table. All patients were told that the ReliefBand acustimulation device produces a sensation which they may or may not feel to minimize bias. Patients recorded outcome measures in a patient diary.
Participants	120 adults undergoing elective plastic surgery. Excluded: antiemetic medication within 24 hours before surgery, pregnancy, using permanent cardiac pacemaker, previous experience with acustimulation treatment, experiencing vomiting or retching within 24 hours before surgery. No patients withdrew before discharge from hospital, 5 patients withdrew from study at 72 hours follow up.

Characteristics of included studies *(Continued)*

Interventions	Group 1: ondansetron 4 mg and inactive acustimulation device at P6 acupoint on arrival in the recovery room. Device worn for 72 hours after surgery. Group 2: saline 2 mL and active acustimulation device at P6 acupoint on arrival in the recovery room. Device worn for 72 hours after surgery. Group 3: ondansetron 4 mg and active acustimulation device at P6 acupoint on arrival in the recovery room. Device worn for 72 hours after surgery.
Outcomes	Nausea (0-hospital discharge), vomiting (0-hospital discharge), incidence of rescue antiemetic, side effects.
Notes	Rescue antiemetic was metoclopramide 10 mg IV if persistent nausea or vomiting or retching lasting more than 10 minutes. Group 3 data was not used for data-analysis. No swelling at wrist or erythema reported. No outcome measures (0-72h) given in the paper.
Allocation concealment	B

Study	***Yang 1993***
Methods	Method of allocation concealment not given. No details about outcome assessor being blinded to treatment groups.
Participants	120 women undergoing gynaecological laparoscopy.
Interventions	Group 1: Acupuncture group included patients given an injection of 0.2 ml 50% glucose in water into P6 acupoint before extubation. Group 2: Antiemetic group was droperidol 20 ug/kg IV on induction of anaesthesia. Group 3: No treatment
Outcomes	Vomiting (0-3h), side effects of acupuncture.
Notes	Reference group received no treatment and was not included in data-analysis. Pain at acupoint site noted.
Allocation concealment	B

Study	***Yentis 1992***
Methods	Method of allocation concealment not given. Medical staff, children and parents were blinded to treatment groups.
Participants	90 children (1 to 16 years) undergoing strabismus surgery. One patient in each of the three groups could not be contacted after surgery.
Interventions	Group 1: Acupuncture at P6 acupoint on right wrist with 5 minutes of manual stimulation after induction of anaesthesia. Group 2: Antiemetic group had 0.075 mg/kg droperidol IV after induction of anaesthesia. Group 3: Acupuncture (as in Group 1) and droperidol (as in Group 2) treatment
Outcomes	Vomiting (0-48h), incidence of rescue antiemetic, side effects of treatment.
Notes	Rescue antiemetic was dimenhydrinate IM. Restlessness more frequent in droperidol group than acupuncture group. Incidence of vomiting before discharge from hospital also reported in paper. Group 3 data was not used in the data-analysis.
Allocation concealment	B

Study	***Zarate 2001***
Methods	Assignment of treatment by computer generated random number table. All patients were told before the operation that the ReliefBand produces a sensation which they may or may not feel to minimize bias. Recovery room nurses were aware of treatment groups.
Participants	250 adults undergoing laparoscopic cholecystectomy. Excluded: patients who had taken antiemetic, glucocorticosteroids, or psychoactive medication within 24 hours before the operation; were pregnant; had an implanted cardiac pacemaker or defibrillator device; or had experienced vomiting or retching within 24 hours before surgery. 29 adults were excluded because of protocol violations.

***Characteristics of included studies** (Continued)*

Interventions	Group 1: ReliefBand (watch like acustimulation device) positioned at P6 acupoint before the end of surgery. The device was set to deliver a 25 mA stimulus at 31 Hz. Patients wore the device for 9 hours after surgery. Group 2: ReliefBand with no acustimulation positioned at P6 acupoint before end of surgery, worn up to 9 hours after surgery. Group 3: ReliefBand with no acustimulation positioned at the dorsal aspect of the wrist before end of surgery, worn up to 9 hours after surgery.
Outcomes	Nausea (0-arrival in recovery room), vomiting (0-arrival in recovery room), incidence of rescue antiemetic (0-2h), side effects of wristband. Rescue antiemetics were droperidol 0.625 mg IV and ondansetron 4 mg IV.
Notes	Group 2 and Group 3 were considered as sham control group for data analysis. Although the ReliefBand devices were identical in appearance, its placement on the dorsal side of the wrist would have suggested that the patients were in Group 3. Outcomes also evaluated at 45,90,120,240,360 and 540 min after surgery. No cumulative data recorded. Side effects of wristbands were mild cutaneous irritation with erythema.
Allocation concealment	B

Characteristics of excluded studies

Study	***Reason for exclusion***
Al-Sadi 1997	No sham treatment group used. Control was defined as no intraoperative acupuncture needle at P6 acupoint.
Coloma 2002	Treatment of established postoperative nausea and vomiting.
Dundee 1988	Incidence of nausea and vomiting were not reported separately.
Dundee 1991	Two different forms of P6 stimulation (acupuncture + saline, acupuncture + 1% lidocaine). No sham treatment group used.
Fan 1997	Incidence of nausea and vomiting were not reported separately.
Fry 1986	No sham treatment group used. Control was defined as no acupressure treatment. Patients did not know that they were in the trial.
McMillan 1994	All transcutaneous electrical stimulation at P6 acupoint groups received antiemetics. Incidence of nausea and vomiting were not reported separately for placebo transcutaneous electrical stimulation and transcutaneous electrical stimulation groups.
Ming 2002	Stimulation of both P6 and H7 acupoints.
Phillips 1994	No sham treatment group used. No specific details of the type of antiemetic drug used as control.
Schwager 1996	Both P6 and Li4 acupoints stimulated.
Shyr 1990	Control was defined as no acupuncture at P6 acupoint.
Somri 2001	Both P6 and CV13 acupoints used.
Stein 1997	Prevention of intraoperative nausea and vomiting.
Weightman 1987	No sham treatment group used. Control was defined as no acupuncture at P6 acupoint after induction of anaesthesia.
Windle 2001	Quasi-experimental design. Randomization done on every third patient who agreed to participate and met study criteria. Retrospective chart review was used to estimate the incidence of vomiting. Incidence of nausea and vomiting were not considered separately, and results were not presented in the paper.
Yentis 1991	No sham treatment group used. Control was no acupuncture treatment at P6 acupoint.
Yentis 1998	This study compared acupuncture given before induction, after induction and in the recovery room. No sham treatment or antiemetic group for comparison.

ADDITIONAL TABLES

Table 01 Estimated NNT for preventing PONV (P6 acupoint stimulation versus sham)

Control event rate	***Nausea***	***95% CI***	***Vomiting***	***95% CI***
10%	36	24 to 91	34	23 to 111
20%	18	12 to 45	17	11 to 56

30%	12	8 to 30	11	8 to 37
40%	9	6 to 23	9	6 to 28
50%	7	5 to 18	7	5 to 22
60%	6	4 to 15	6	4 to 19
70%	5	3 to 13	5	3 to 16
80%	4	3 to 11	4	3 to 14
90%	4	3 to 10	4	3 to 12

Table 02 Estimated NNT for preventing PONV (P6 acupoint stimulation versus antiemetic)

Control event rate	*Nausea*	*95% CI*	*Vomiting*	*95% CI*
10%	33	20 to 500	125	NNTB 29 to inf to NNTH 34
20%	17	10 to 250	63	NNTB 14 to inf to NNTH 17
30%	11	7 to 167	42	NNTB 10 to inf to NNTH 11
40%	8	5 to 125	31	NNTB 7 to inf to NNTH 9
50%	7	4 to 100	25	NNTB 6 to inf to NNTH 7
60%	6	3 to 83	21	NNTB 5 to inf to NNTH 6
70%	5	3 to 71	18	NNTB 4 to inf to NNTH 5
80%	4	3 to 63	16	NNTB 4 to inf to NNTH 4
90%	4	2 to 56	14	NNTB 3 to inf to NNTH 4

GRAPHS

Comparison 01 Acupoint P6 stimulation versus sham

Outcome title	*No. of studies*	*No. of participants*	*Statistical method*	*Effect size*
01 Nausea			Relative Risk (Random) 95% CI	Subtotals only
02 Vomiting			Relative Risk (Random) 95% CI	Subtotals only
03 Rescue antiemetics	15	1492	Relative Risk (Random) 95% CI	0.76 [0.58, 1.00]

Comparison 02 Acupoint P6 stimulation versus antiemetic

Outcome title	*No. of studies*	*No. of participants*	*Statistical method*	*Effect size*
01 Nausea			Relative Risk (Random) 95% CI	Subtotals only
02 Vomiting			Relative Risk (Random) 95% CI	Subtotals only
03 Rescue antiemetic	3	279	Relative Risk (Random) 95% CI	0.78 [0.54, 1.14]

COVER SHEET

Title	Stimulation of the wrist acupuncture point P6 for preventing postoperative nausea and vomiting
Authors	Lee A, Done ML
Contribution of author(s)	Anna Lee (AL) initiated and designed the study, extracted the data, conducted statistical analyses, wrote the first draft of the review, and incorporated comments from Mary Done

	(MLD), Anesthesia and Analgesia, and Cochrane peer reviewers into the final version. MLD provided comments to data extraction forms and extracted the data and commented on all drafts of the review.
Issue protocol first published	2001/4
Review first published	2004/3
Date of most recent amendment	14 October 2004
Date of most recent SUBSTANTIVE amendment	23 April 2004
Most recent changes	"Stimulation of the wrist acupuncture point P6 for preventing postoperative nausea and vomiting" was published as a protocol under the title: "Acupoint P6 stimulaton for preventing postoperative nausea and vomiting".
Date new studies sought but none found	Information not supplied by author
Date new studies found but not yet included/excluded	Information not supplied by author
Date new studies found and included/excluded	Information not supplied by author
Date authors' conclusions section amended	Information not supplied by author
Contact address	Dr Anna Lee Assistant Professor Anaesthesia and Intensive Care The Chinese University of Hong Kong, Prince of Wales Hospital Shatin HONG KONG Telephone: 852 2632 2735 E-mail: annalee@cuhk.edu.hk Facsimile: 852 2637 2422
Cochrane Library number	CD003281
Editorial group	Cochrane Anaesthesia Group
Editorial group code	HM-ANAESTH

GRAPHS AND OTHER TABLES

Fig. 1. Funnel plot for acupoint P6 stimulation versus sham for preventing nausea

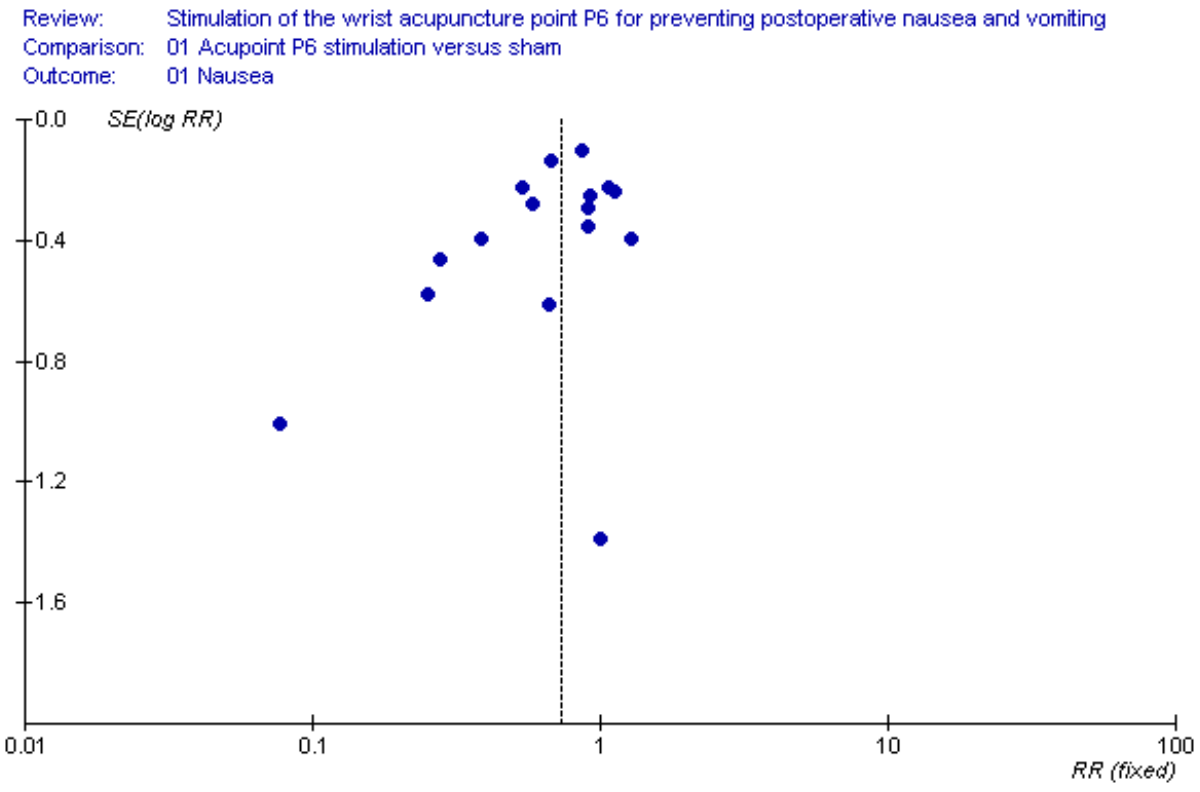


Fig. 2. Funnel plot for acupoint P6 stimulation versus sham for preventing vomiting

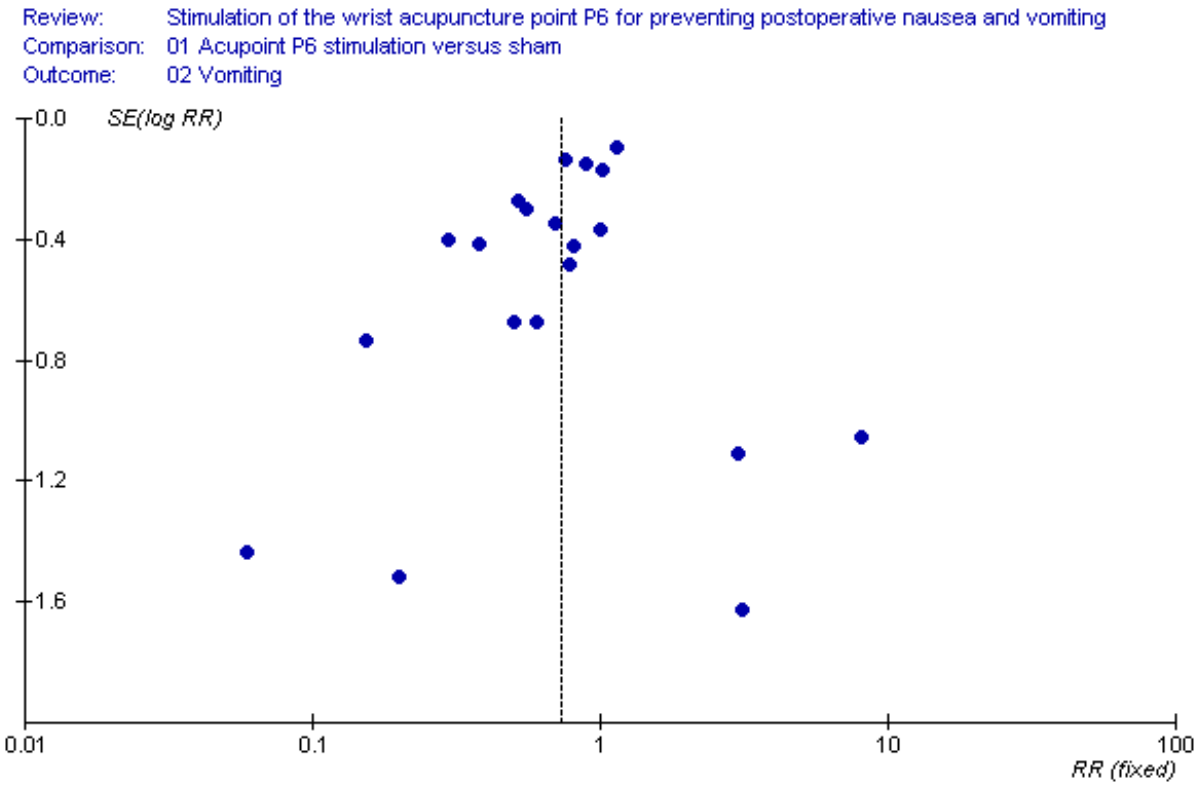


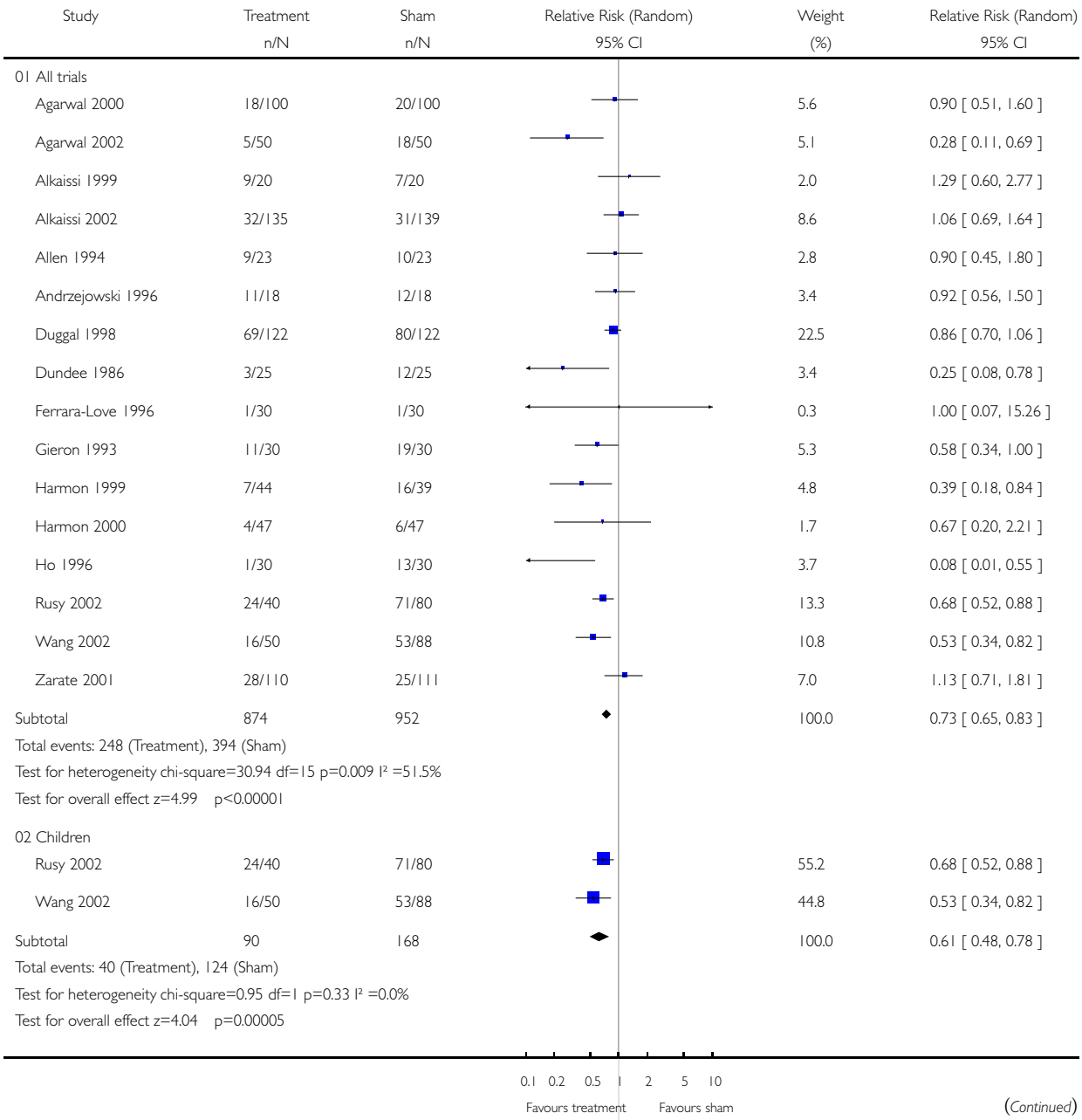
Fig. 3. Comparison 01 Acupoint P6 stimulation versus sham

01.01 Nausea

Review: Stimulation of the wrist acupuncture point P6 for preventing postoperative nausea and vomiting

Comparison: 01 Acupoint P6 stimulation versus sham

Outcome: 01 Nausea



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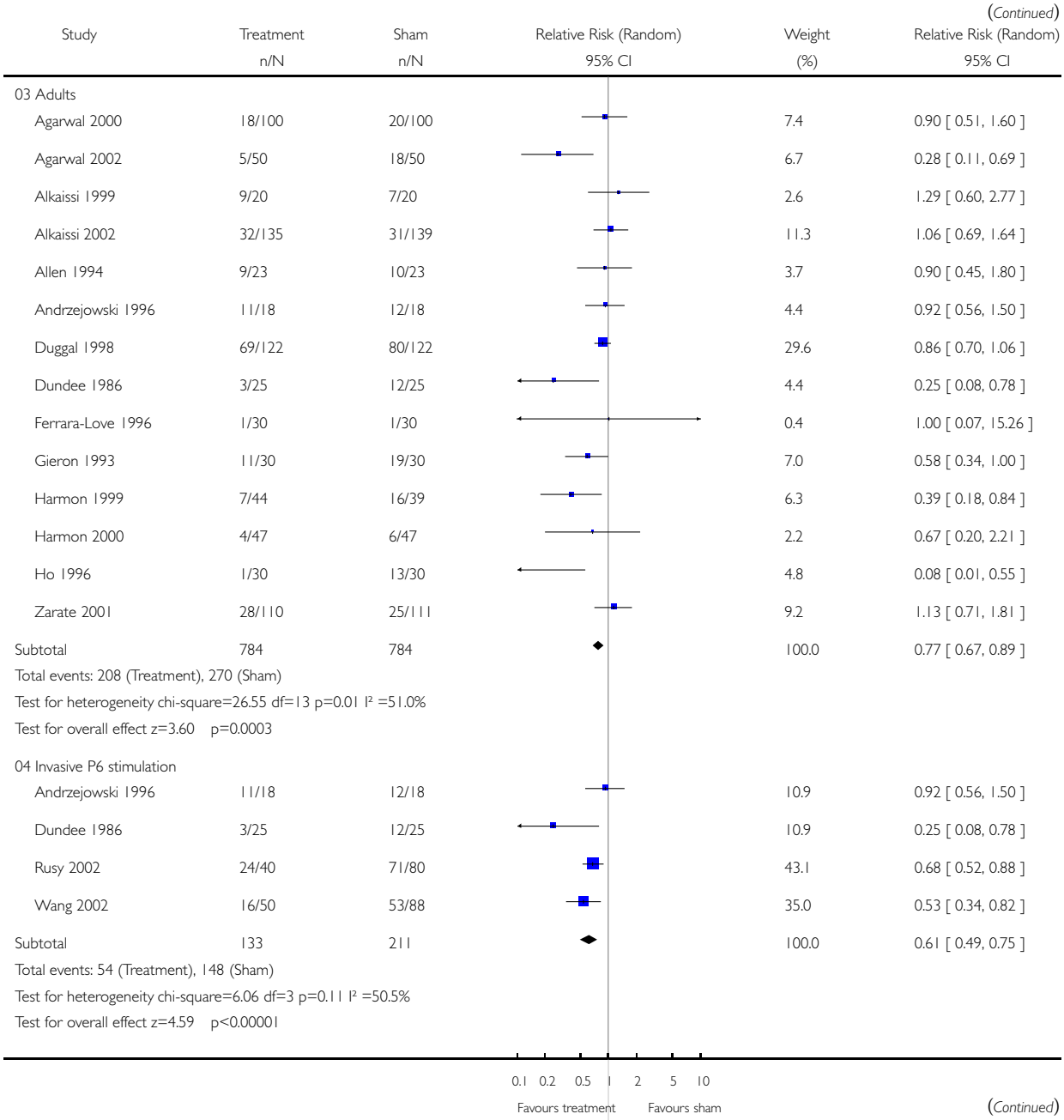

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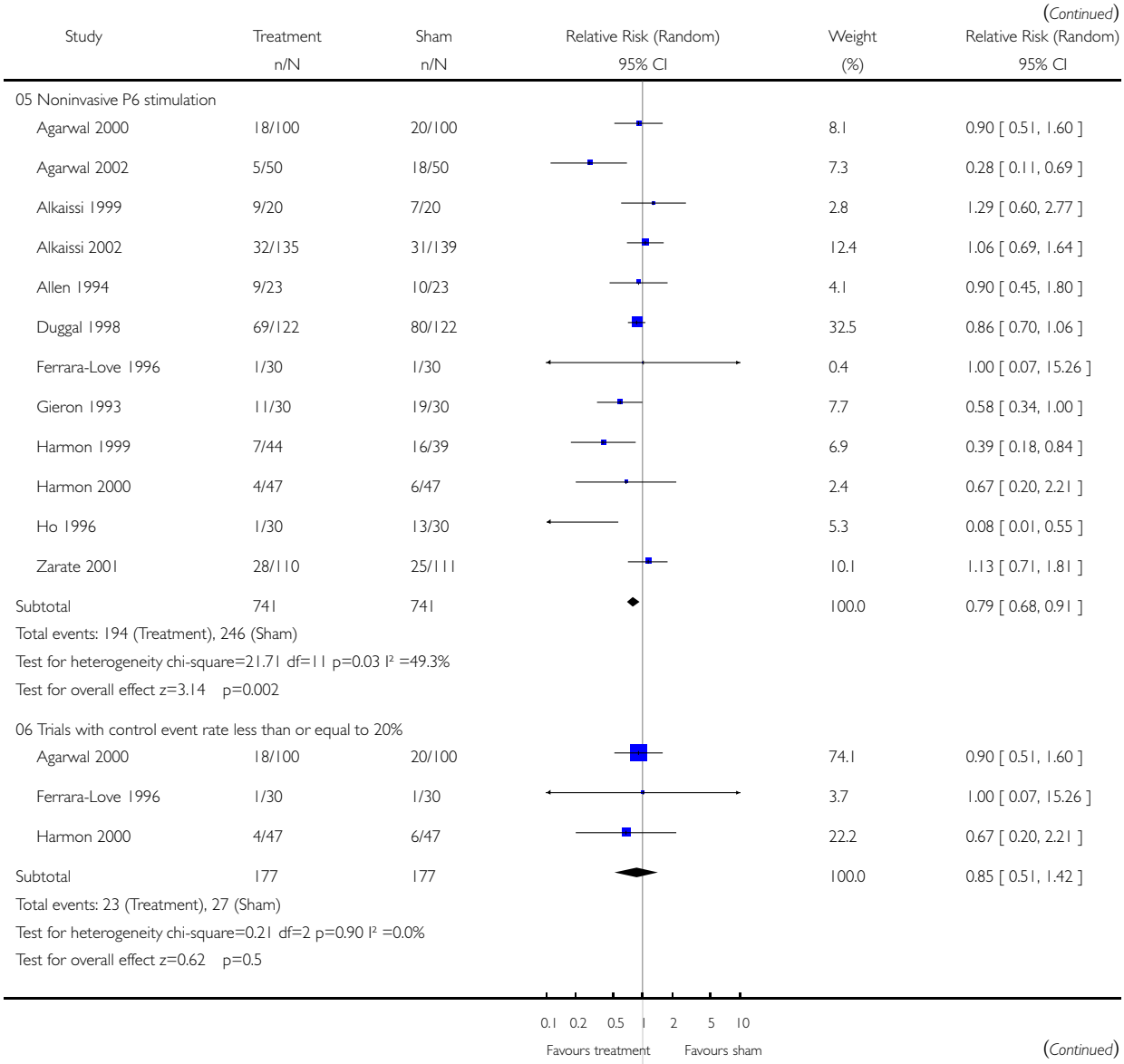

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Study	Treatment n/N	Sham n/N	Relative Risk (Random) 95% CI	Weight (%)	Relative Risk (Random) 95% CI
07 Trials with control event rate more than 20%					
Agarwal 2002	5/50	18/50		5.5	0.28 [0.11, 0.69]
Alkaissi 1999	9/20	7/20		2.1	1.29 [0.60, 2.77]
Alkaissi 2002	32/135	31/139		9.3	1.06 [0.69, 1.64]
Allen 1994	9/23	10/23		3.0	0.90 [0.45, 1.80]
Andrzejowski 1996	11/18	12/18		3.6	0.92 [0.56, 1.50]
Duggal 1998	69/122	80/122		24.3	0.86 [0.70, 1.06]
Dundee 1986	3/25	12/25		3.6	0.25 [0.08, 0.78]
Gieron 1993	11/30	19/30		5.8	0.58 [0.34, 1.00]
Harmon 1999	7/44	16/39		5.2	0.39 [0.18, 0.84]
Ho 1996	1/30	13/30		3.9	0.08 [0.01, 0.55]
Rusy 2002	24/40	71/80		14.4	0.68 [0.52, 0.88]
Wang 2002	16/50	53/88		11.7	0.53 [0.34, 0.82]
Zarate 2001	28/110	25/111		7.6	1.13 [0.71, 1.81]
Subtotal	697	775		100.0	0.72 [0.64, 0.82]
Total events: 225 (Treatment), 367 (Sham)					
Test for heterogeneity chi-square=30.74 df=12 p=0.002 I^2 =61.0%					
Test for overall effect z=5.08 p<0.00001					

Fig. 4. Comparison 01 Acupoint P6 stimulation versus sham

01.02 Vomiting

Review: Stimulation of the wrist acupuncture point P6 for preventing postoperative nausea and vomiting

Comparison: 01 Acupoint P6 stimulation versus sham

Outcome: 02 Vomiting

Study	Treatment n/N	Sham n/N	Relative Risk (Random) 95% CI	Weight (%)	Relative Risk (Random) 95% CI
01 All trials					
Agarwal 2000	7/100	9/100		2.8	0.78 [0.30, 2.01]
Agarwal 2002	2/50	13/50		4.1	0.15 [0.04, 0.65]
Alkaissi 1999	0/20	2/20		0.8	0.20 [0.01, 3.92]
Alkaissi 2002	1/135	0/139		0.2	3.09 [0.13, 75.15]
Allen 1994	9/23	9/23		2.8	1.00 [0.49, 2.06]
Andrzejowski 1996	3/18	1/18		0.3	3.00 [0.34, 26.19]
Barsoum 1990	8/49	11/54		3.3	0.80 [0.35, 1.83]
Duggal 1998	50/122	56/122		17.6	0.89 [0.67, 1.19]
Dundee 1986	3/25	5/25		1.6	0.60 [0.16, 2.25]
Fassoulaki 1993	12/51	22/52		6.8	0.56 [0.31, 1.00]
Gieron 1993	9/30	13/30		4.1	0.69 [0.35, 1.37]
Harmon 1999	3/47	6/47		1.9	0.50 [0.13, 1.88]
Harmon 2000	13/47	25/47		7.9	0.52 [0.30, 0.89]
Ho 1996	0/30	8/30		2.7	0.06 [0.00, 0.98]
Lewis 1991	29/31	27/33		8.2	1.14 [0.95, 1.38]
Rusy 2002	25/40	66/80		13.8	0.76 [0.58, 0.98]
Schlager 1998	5/20	17/20		5.3	0.29 [0.13, 0.64]
Shenkman 1999	28/47	31/53		9.2	1.02 [0.73, 1.41]
Wang 2002	6/50	28/88		6.4	0.38 [0.17, 0.85]
Zarate 2001	8/110	1/111		0.3	8.07 [1.03, 63.47]
Subtotal	1045	1142		100.0	0.74 [0.65, 0.84]

Total events: 221 (Treatment), 350 (Sham)

Test for heterogeneity chi-square=54.21 df=19 p=<0.0001 I^2 =65.0%

Test for overall effect z=4.64 p<0.00001

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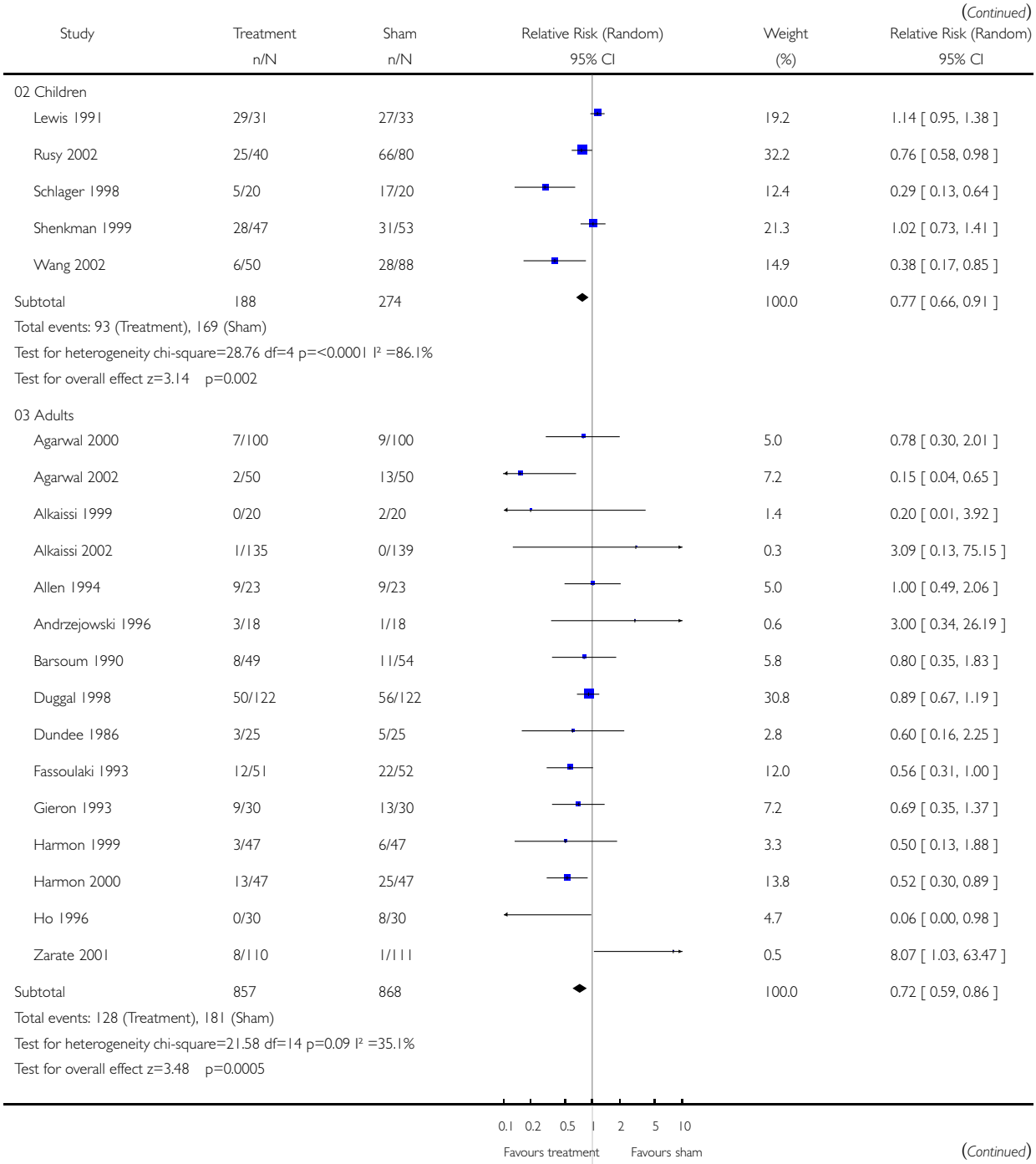

Study	Treatment n/N	Sham n/N	Relative Risk (Random) 95% CI	Weight (%)	Relative Risk (Random) 95% CI
02 Children					
Lewis 1991	29/31	27/33		19.2	1.14 [0.95, 1.38]
Rusy 2002	25/40	66/80		32.2	0.76 [0.58, 0.98]
Schlager 1998	5/20	17/20		12.4	0.29 [0.13, 0.64]
Shenkman 1999	28/47	31/53		21.3	1.02 [0.73, 1.41]
Wang 2002	6/50	28/88		14.9	0.38 [0.17, 0.85]
Subtotal	188	274		100.0	0.77 [0.66, 0.91]
Total events: 93 (Treatment), 169 (Sham)					
Test for heterogeneity chi-square=28.76 df=4 p=<0.0001 I^2 =86.1%					
Test for overall effect z=3.14 p=0.002					
03 Adults					
Agarwal 2000	7/100	9/100		5.0	0.78 [0.30, 2.01]
Agarwal 2002	2/50	13/50		7.2	0.15 [0.04, 0.65]
Alkaissi 1999	0/20	2/20		1.4	0.20 [0.01, 3.92]
Alkaissi 2002	1/135	0/139		0.3	3.09 [0.13, 75.15]
Allen 1994	9/23	9/23		5.0	1.00 [0.49, 2.06]
Andrzejowski 1996	3/18	1/18		0.6	3.00 [0.34, 26.19]
Barsoum 1990	8/49	11/54		5.8	0.80 [0.35, 1.83]
Duggal 1998	50/122	56/122		30.8	0.89 [0.67, 1.19]
Dundee 1986	3/25	5/25		2.8	0.60 [0.16, 2.25]
Fassoulaki 1993	12/51	22/52		12.0	0.56 [0.31, 1.00]
Gieron 1993	9/30	13/30		7.2	0.69 [0.35, 1.37]
Harmon 1999	3/47	6/47		3.3	0.50 [0.13, 1.88]
Harmon 2000	13/47	25/47		13.8	0.52 [0.30, 0.89]
Ho 1996	0/30	8/30		4.7	0.06 [0.00, 0.98]
Zarate 2001	8/110	1/111		0.5	8.07 [1.03, 63.47]
Subtotal	857	868		100.0	0.72 [0.59, 0.86]
Total events: 128 (Treatment), 181 (Sham)					
Test for heterogeneity chi-square=21.58 df=14 p=0.09 I^2 =35.1%					
Test for overall effect z=3.48 p=0.0005					

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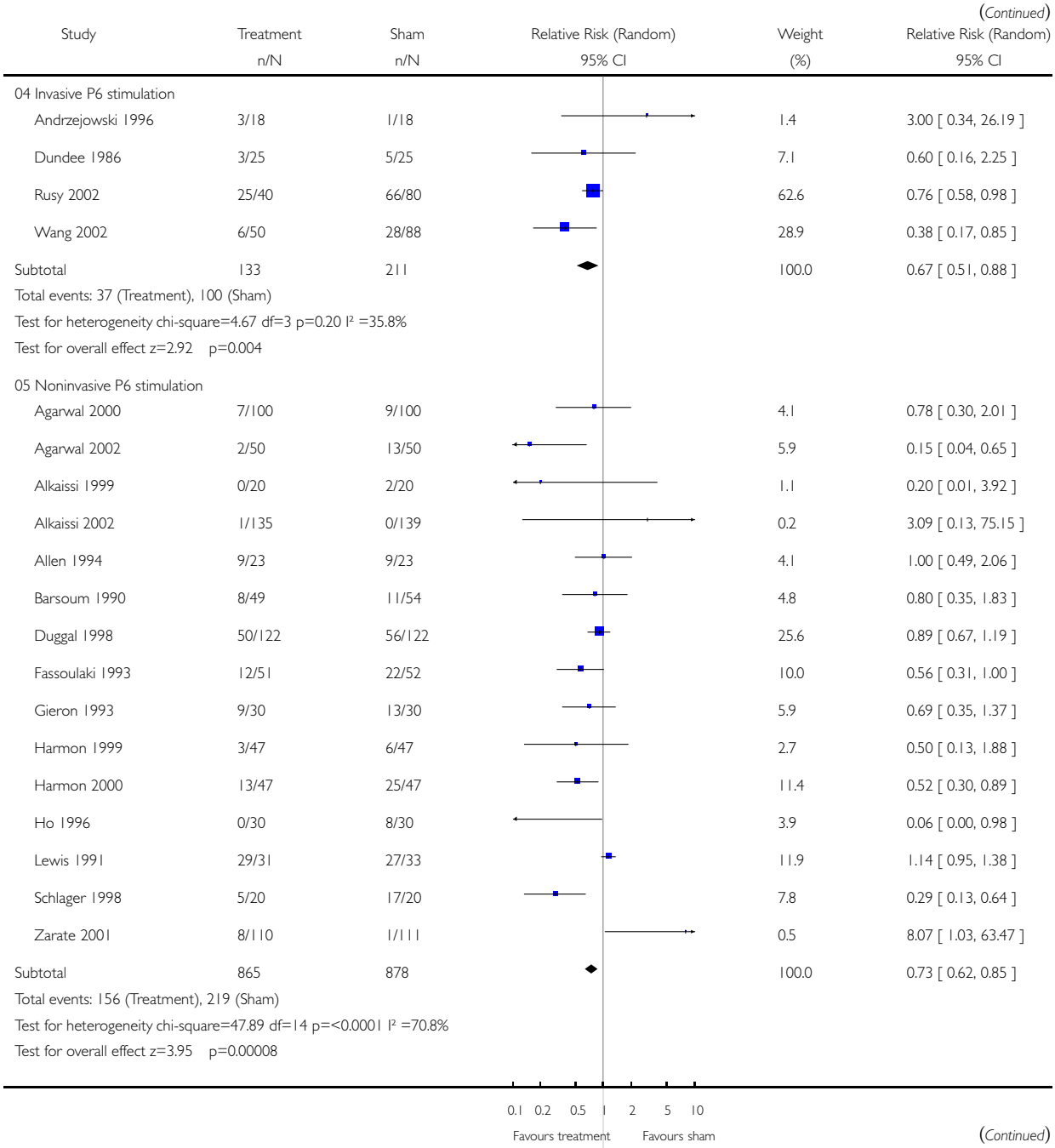

Study	Treatment n/N	Sham n/N	Relative Risk (Random) 95% CI	Weight (%)	Relative Risk (Random) 95% CI
04 Invasive P6 stimulation					
Andrzejowski 1996	3/18	1/18		1.4	3.00 [0.34, 26.19]
Dundee 1986	3/25	5/25		7.1	0.60 [0.16, 2.25]
Rusy 2002	25/40	66/80		62.6	0.76 [0.58, 0.98]
Wang 2002	6/50	28/88		28.9	0.38 [0.17, 0.85]
Subtotal	133	211		100.0	0.67 [0.51, 0.88]
Total events: 37 (Treatment), 100 (Sham)					
Test for heterogeneity chi-square=4.67 df=3 p=0.20 I^2 =35.8%					
Test for overall effect z=2.92 p=0.004					
05 Noninvasive P6 stimulation					
Agarwal 2000	7/100	9/100		4.1	0.78 [0.30, 2.01]
Agarwal 2002	2/50	13/50		5.9	0.15 [0.04, 0.65]
Alkaissi 1999	0/20	2/20		1.1	0.20 [0.01, 3.92]
Alkaissi 2002	1/135	0/139		0.2	3.09 [0.13, 75.15]
Allen 1994	9/23	9/23		4.1	1.00 [0.49, 2.06]
Barsoum 1990	8/49	11/54		4.8	0.80 [0.35, 1.83]
Duggal 1998	50/122	56/122		25.6	0.89 [0.67, 1.19]
Fassoulaki 1993	12/51	22/52		10.0	0.56 [0.31, 1.00]
Gieron 1993	9/30	13/30		5.9	0.69 [0.35, 1.37]
Harmon 1999	3/47	6/47		2.7	0.50 [0.13, 1.88]
Harmon 2000	13/47	25/47		11.4	0.52 [0.30, 0.89]
Ho 1996	0/30	8/30		3.9	0.06 [0.00, 0.98]
Lewis 1991	29/31	27/33		11.9	1.14 [0.95, 1.38]
Schlager 1998	5/20	17/20		7.8	0.29 [0.13, 0.64]
Zarate 2001	8/110	1/111		0.5	8.07 [1.03, 63.47]
Subtotal	865	878		100.0	0.73 [0.62, 0.85]
Total events: 156 (Treatment), 219 (Sham)					
Test for heterogeneity chi-square=47.89 df=14 p=<0.0001 I^2 =70.8%					
Test for overall effect z=3.95 p=0.00008					

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Study	Treatment n/N	Sham n/N	Relative Risk (Random) 95% CI	Weight (%)	Relative Risk (Random) 95% CI
06 Trials with control event rate less than or equal to 20%					
Agarwal 2000	7/100	9/100		29.6	0.78 [0.30, 2.01]
Alkaissi 1999	0/20	2/20		8.2	0.20 [0.01, 3.92]
Alkaissi 2002	1/135	0/139		1.6	3.09 [0.13, 75.15]
Andrzejowski 1996	3/18	1/18		3.3	3.00 [0.34, 26.19]
Barsoum 1990	8/49	11/54		34.4	0.80 [0.35, 1.83]
Harmon 1999	3/47	6/47		19.7	0.50 [0.13, 1.88]
Zarate 2001	8/110	1/111		3.3	8.07 [1.03, 63.47]
Subtotal	479	489		100.0	1.03 [0.64, 1.66]
Total events: 30 (Treatment), 30 (Sham)					
Test for heterogeneity chi-square=8.23 df=6 p=0.22 I^2 =27.1%					
Test for overall effect z=0.13 p=0.9					
07 Trials with control event rate more than 20%					
Agarwal 2002	2/50	13/50		4.5	0.15 [0.04, 0.65]
Allen 1994	9/23	9/23		3.1	1.00 [0.49, 2.06]
Duggal 1998	50/122	56/122		19.5	0.89 [0.67, 1.19]
Dundee 1986	3/25	5/25		1.7	0.60 [0.16, 2.25]
Fassoulaki 1993	12/51	22/52		7.6	0.56 [0.31, 1.00]
Gieron 1993	9/30	13/30		4.5	0.69 [0.35, 1.37]
Harmon 2000	13/47	25/47		8.7	0.52 [0.30, 0.89]
Ho 1996	0/30	8/30		3.0	0.06 [0.00, 0.98]
Lewis 1991	29/31	27/33		9.1	1.14 [0.95, 1.38]
Rusy 2002	25/40	66/80		15.3	0.76 [0.58, 0.98]
Schlager 1998	5/20	17/20		5.9	0.29 [0.13, 0.64]
Shenkman 1999	28/47	31/53		10.1	1.02 [0.73, 1.41]
Wang 2002	6/50	28/88		7.0	0.38 [0.17, 0.85]
Subtotal	566	653		100.0	0.71 [0.62, 0.81]
Total events: 191 (Treatment), 320 (Sham)					
Test for heterogeneity chi-square=50.34 df=12 p=<0.0001 I^2 =76.2%					
Test for overall effect z=5.17 p<0.00001					

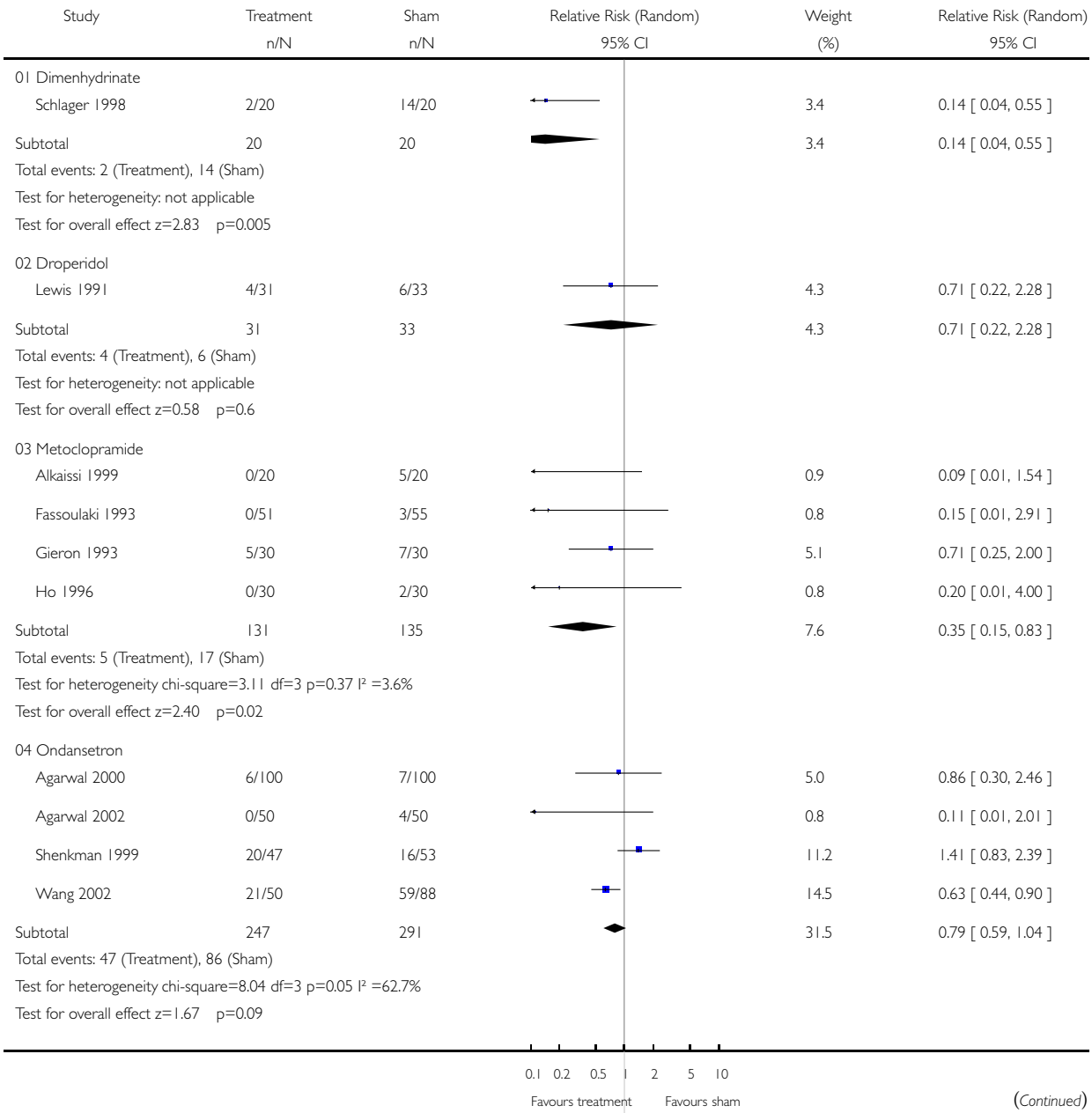
Fig. 5. Comparison 01 Acupoint P6 stimulation versus sham

01.03 Rescue antiemetics

Review: Stimulation of the wrist acupuncture point P6 for preventing postoperative nausea and vomiting

Comparison: 01 Acupoint P6 stimulation versus sham

Outcome: 03 Rescue antiemetics



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Study	Treatment n/N	Sham n/N	Relative Risk (Random) 95% CI	Weight (%)	Relative Risk (Random) 95% CI
05 Prochlorperazine					
Andrzejowski 1996	9/18	7/18		8.0	1.29 [0.61, 2.70]
Barsoum 1990	16/49	24/54		11.7	0.73 [0.45, 1.21]
Subtotal	67	72		19.6	0.86 [0.57, 1.30]
Total events: 25 (Treatment), 31 (Sham)					
Test for heterogeneity chi-square=1.51 df=1 p=0.22 I^2 =33.7%					
Test for overall effect z=0.70 p=0.5					
06 Ondansetron and droperidol					
Rusy 2002	23/40	57/80		15.6	0.81 [0.60, 1.09]
Zarate 2001	40/110	35/111		14.2	1.15 [0.80, 1.67]
Subtotal	150	191		29.8	0.97 [0.77, 1.24]
Total events: 63 (Treatment), 92 (Sham)					
Test for heterogeneity chi-square=2.30 df=1 p=0.13 I^2 =56.5%					
Test for overall effect z=0.23 p=0.8					
07 Ondansetron and prochlorperazine					
Harmon 1999	3/52	9/52		3.8	0.33 [0.10, 1.16]
Subtotal	52	52		3.8	0.33 [0.10, 1.16]
Total events: 3 (Treatment), 9 (Sham)					
Test for heterogeneity: not applicable					
Test for overall effect z=1.72 p=0.08					
Total	698	794		100.0	0.76 [0.58, 1.00]
Total events: 149 (Treatment), 255 (Sham)					
Test for heterogeneity chi-square=26.81 df=14 p=0.02 I^2 =47.8%					
Test for overall effect z=1.97 p=0.05					

Fig. 6. Comparison 02 Acupoint P6 stimulation versus antiemetic

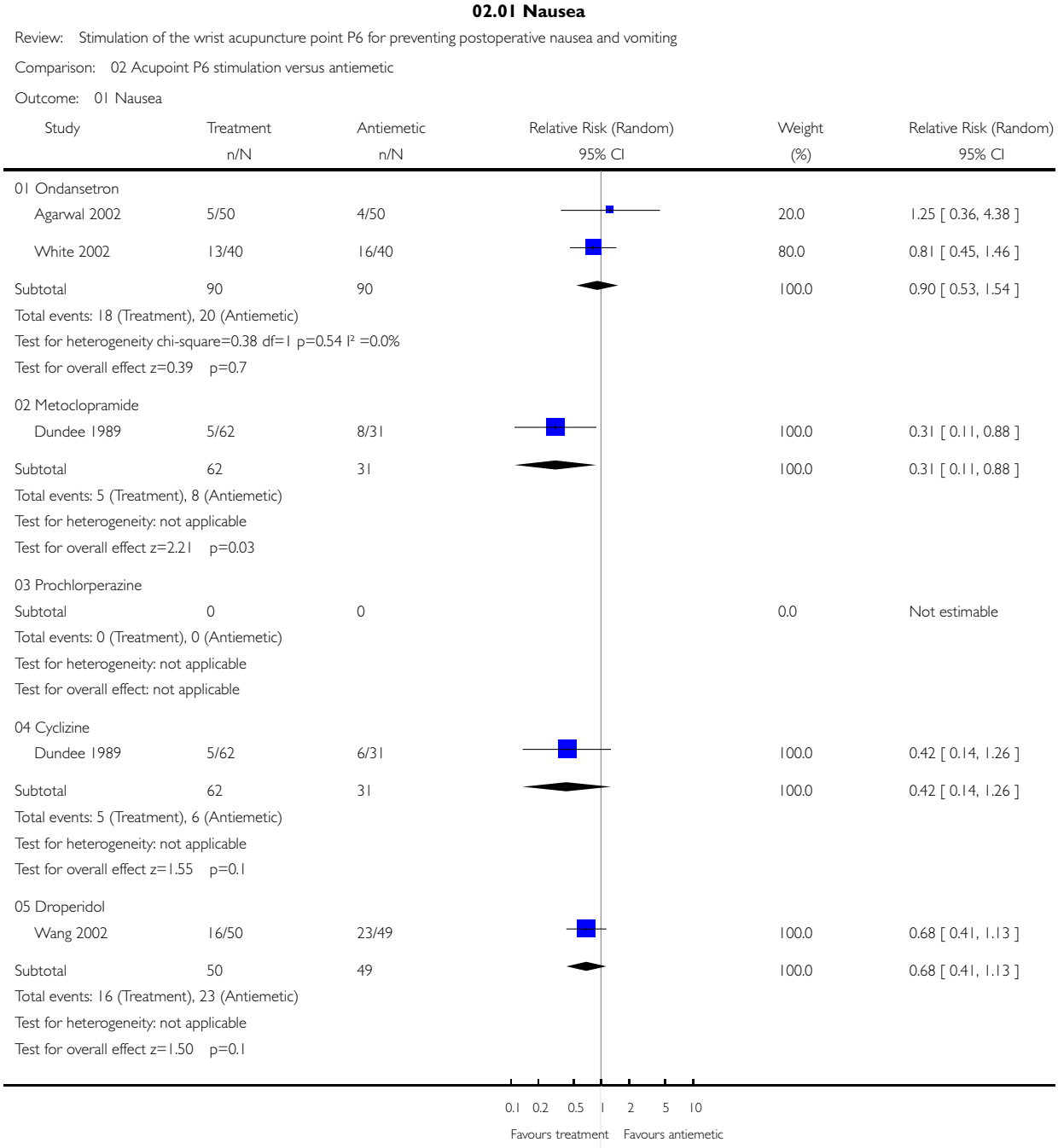

Fig. 7. Comparison 02 Acupoint P6 stimulation versus antiemetic

02.02 Vomiting

Review: Stimulation of the wrist acupuncture point P6 for preventing postoperative nausea and vomiting

Comparison: 02 Acupoint P6 stimulation versus antiemetic

Outcome: 02 Vomiting

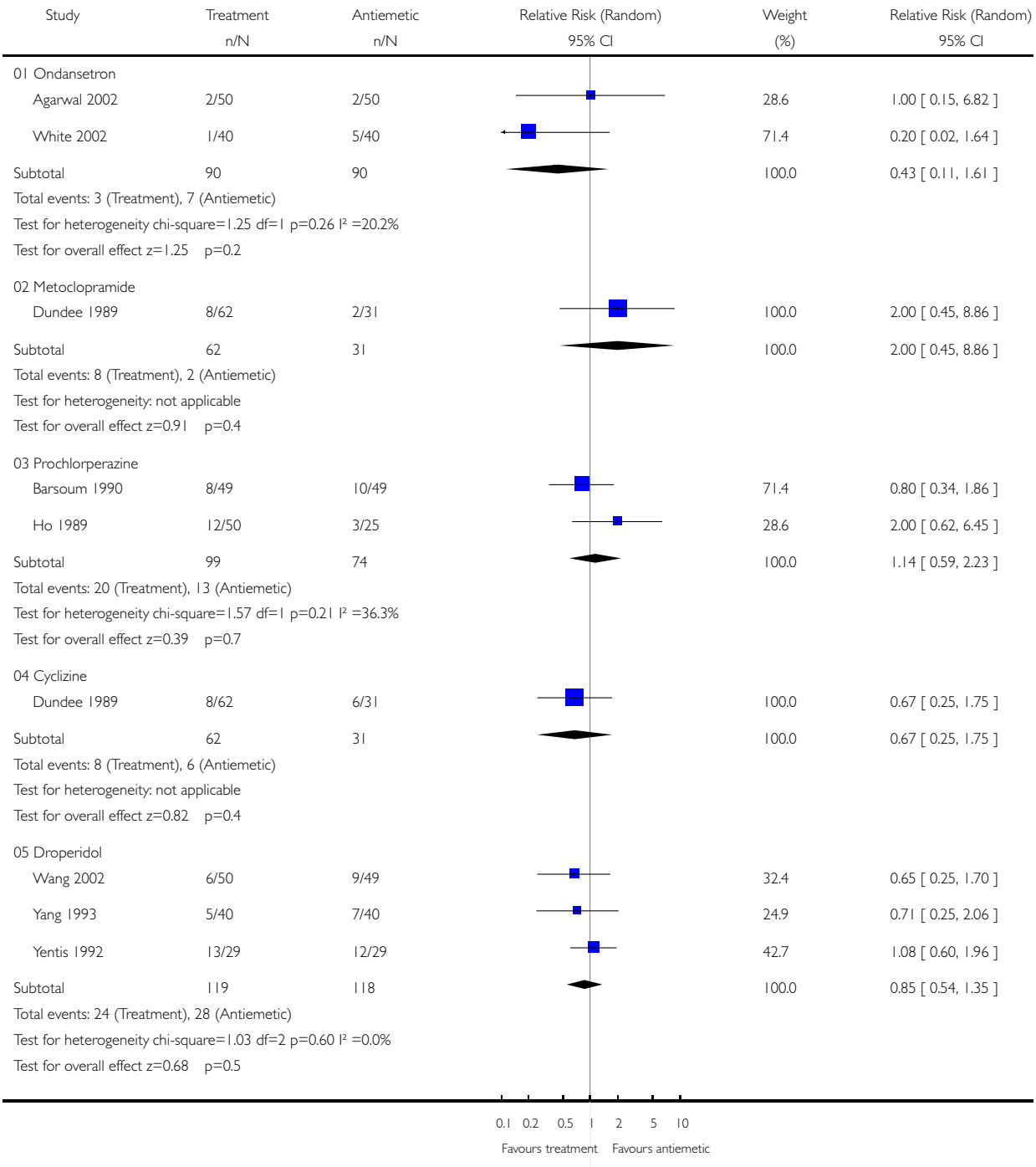

Fig. 8. Comparison 02 Acupoint P6 stimulation versus antiemetic

02.03 Rescue antiemetic

Review: Stimulation of the wrist acupuncture point P6 for preventing postoperative nausea and vomiting

Comparison: 02 Acupoint P6 stimulation versus antiemetic

Outcome: 03 Rescue antiemetic