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

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Abstract

Background—Postoperative nausea and vomiting (PONV) are common complications following surgery and anaesthesia. Drugs to prevent PONV are only partially effective. An alternative approach is to stimulate the P6 acupoint on the wrist. This is an update of a Cochrane review first published in 2004.

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

Search strategy—We searched CENTRAL (*The Cochrane Library*, Issue 3, 2008), MEDLINE (January 1966 to September 2008), EMBASE (January 1988 to September 2008), ISI Web of Science (January 1965 to September 2008), the National Library of Medicine publication list of acupuncture studies, and reference lists of articles.

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, capsicum plaster, an acu-stimulation device, and acupressure in patients undergoing surgery. Primary outcomes were the risks of nausea and vomiting. Secondary outcomes were the need for rescue antiemetic therapy and adverse effects.

Data collection and analysis—Two review authors independently assessed trial quality and extracted the data. We collected adverse effect information from the trials. We used a random-effects model and reported relative risk (RR) with associated 95% confidence intervals (95% CI).

Main results—We included 40 trials involving 4858 participants; four trials reported adequate allocation concealment. Twelve trials did not report all outcomes. Compared with sham treatment P6 acupoint stimulation significantly reduced: nausea (RR 0.71, 95% CI 0.61 to 0.83); vomiting (RR 0.70, 95% CI 0.59 to 0.83), and the need for rescue antiemetics (RR 0.69, 95% CI 0.57 to

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CONTRIBUTIONS OF AUTHORS

Anna Lee (AL) initiated and designed the review, extracted the data, conducted statistical analyses, wrote the first draft of the review, and incorporated comments from Mary Done, Anesthesia and Analgesia, and Cochrane peer reviewers into the final version (Lee 2004). Lawrence Fan provided comments on data extraction forms, extracted the data, and commented on all drafts of this updated review.

DECLARATIONS OF INTEREST

None known

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

This updated review also assesses the differences in risk of PONV after combination P6 acupoint stimulation and antiemetic drugs with sham treatment.

0.83). Heterogeneity among trials was moderate. There was no clear difference in the effectiveness of P6 acupoint stimulation for adults and children; or for invasive and noninvasive acupoint stimulation. There was no evidence of difference between P6 acupoint stimulation and antiemetic drugs in the risk of nausea (RR 0.82, 95% CI 0.60 to 1.13), vomiting (RR 1.01, 95% CI 0.77 to 1.31), or the need for rescue antiemetics (RR 0.82, 95%CI 0.59 to 1.13). The side effects associated with P6 acupoint stimulation were minor. There was no evidence of publication bias from contour-enhanced funnel plots.

Authors' conclusions—P6 acupoint stimulation prevented PONV. There was no reliable evidence for differences in risks of postoperative nausea or vomiting after P6 acupoint stimulation compared to antiemetic drugs.

Medical Subject Headings (MeSH)

*Acupuncture Points; *Wrist; Antiemetics [therapeutic use]; Postoperative Nausea and Vomiting [*prevention & control]; Randomized Controlled Trials as Topic

MeSH check words

Humans

PLAIN LANGUAGE SUMMARY

P6 acupoint stimulation prevents postoperative nausea and vomiting with few side effects

Postoperative nausea and vomiting (PONV) are two of the most common complications after anaesthesia and surgery. Drugs are 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. The risks of postoperative nausea and vomiting were similar after P6 acupoint stimulation and antiemetic drugs.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON *[Explanation]*

Acupoint P6 stimulation versus sham to prevent postoperative nausea and vomiting						
Patient or population: patients with a desire to prevent postoperative nausea and vomiting						
Settings: Surgery						
Intervention: Acupoint P6 stimulation versus sham						
Outcomes	**Illustrative comparative risks* (95% CI)**		**Relative effect (95% CI)**	**No of Participants (studies)**	**Quality of the evidence (GRADE)**	**Comments**
	Assumed risk	**Corresponding risk**				
	Control	**Acupoint P6 stimulation versus sham**				
Nausea - All trials	**Low risk population**[1]		**RR 0.71** (0.61 to 0.83)	2962 (27)	⊕⊕⊕○ **moderate**[2]	
	100 per 1000	**71 per 1000** (61 to 83)				
	High risk population[1]					
	400 per 1000	**284 per 1000** (244 to 332)				

Vomiting - All trials	**Low risk population**[1]		**RR 0.7** (0.59 to 0.83)	3385 (32)	⊕⊕⊕○ **moderate**[2]
	100 per 1000	**70 per 1000** (59 to 83)			
	High risk population[1]				
	400 per 1000	**280 per 1000** (236 to 332)			
Rescue antiemetics	**Medium risk population**		**RR 0.69** (0.57 to 0.83)	2661 (26)	⊕⊕⊕○ **moderate**[2]
	363 per 1000	**250 per 1000** (207 to 301)			
Adverse effects[3]	See comment	See comment	Not estimable[3]	-	See comment

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval; RR: Risk ratio;

GRADE Working Group grades of evidance
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1] No risk factors for postoperative nausea and vomiting typically have control rates of 10%; most studies in this systematic review had high risk patients with two or more risk factors for postoperative nausea and vomiting, therefore we assumed a risk of 40%.

[2] Unexplained moderate heterogeneity among trials even after subgroup analyses.

[3] The tolerability of P6 acupoint stimulation was good with no complaints of side effects in 12 studies (1328 participants). Other self-limiting minor side effects in a few patients from other studies were: redness, irritation and haematoma at puncture site with acupuncture; swollen wrists, red indentation, itching and blistering at the site of the wristband stud; fatigue with electro-acupuncture; mild irritation at the site of capsicum plaster application.

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). A systematic review of antiemetic drugs for PONV (Carlisle 2006) showed that eight drugs effectively prevented PONV when compared to placebo: droperidol, metoclopramide, ondansetron, tropisetron, dolasetron, dexamethasone, cyclizine, and granisetron. The relative risks varied between 0.60 and 0.80, depending on the drug and the outcome (Carlisle 2006). Evidence for side effects was sparse: droperidol was sedative (RR 1.32) and headache was more common after ondansetron (RR 1.16) (Carlisle 2006). More recently, a multidisciplinary panel of experts produced guidelines for the prevention or minimization of PONV using prophylactic or rescue therapy, either separately or in combination (Gan 2007).

As anaesthetists continue to search for more cost-effective approaches to improving patient outcomes, attention has focused on simple, inexpensive, and non-invasive methods to prevent PONV. Concern about the cost and side effects of drugs has led to interest in the use of alternative approaches to preventing emesis.

Various non-pharmacological techniques have been examined in trials as alternatives to antiemetic drugs; these include acupuncture, electro-acupuncture, laser acupuncture, transcutaneous electrical nerve stimulation (TENS), acupoint stimulation, acupressure, and

capsicum plaster. Most non-pharmacological studies have focused on stimulation of the wrist at the 'Pericardium (P6) acupuncture point' to reduce nausea and vomiting. The P6 acupoint lies between the tendons of the palmaris longus and flexor carpi radialis muscles, 4 cm 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 PONVinclude Shenmen (H7) (Ming 2002) and Shang Wen (CV13) (Somri 2001).

Both the role and efficacy of P6 acupoint stimulation in the prevention of PONV are unclear. For example, P6 acupoint stimulation significantly reduced the risk of PONV in some studies (Amir 2007; Butkovic 2005; Ho 1996; Rusy 2002; Turgut 2007; Wang 2002) but not in others (Agarwal 2000; Allen 1994; Barsoum 1990; Misra 2005; Shenkman 1999). 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 results of a systematic review (Petitti 1994).

Our previous systematic review of trials (Lee 1999), including trials 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.

In the earlier version of this Cochrane review (Lee 2004) of 26 trials (n = 3347), we showed that 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 group. Publication bias may have affected the RR estimated for postoperative nausea but not for vomiting (Lee 2006).

OBJECTIVES

To assess the prevention of nausea, vomiting, or requirement for rescue antiemesis (PONV) by acupoint stimulation.

We assessed whether the risks of PONV were different:

1. after P6 acupoint stimulation compared to sham treatment, where '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. after P6 acupoint stimulation for adults compared with children;
3. for invasive P6 acupoint stimulation compared with noninvasive stimulation, where 'invasive P6 acupoint stimulation' was defined as penetration of the skin at P6 acupoint (with manual rotation of acupuncture needle, electrical stimulation of acupuncture needle) and '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 P6 acupoint, capsicum plaster at P6 acupoint);
4. after P6 acupoint stimulation in trials with low risk of bias compared with unclear or high risk of bias;

5. after P6 acupoint stimulation compared with antiemetic drugs;
6. after a combination of P6 acupoint stimulation and antiemetic drug compared with sham treatment.

We assessed these effects 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).

METHODS

Criteria for considering studies for this review

Types of studies—All randomized controlled trials (RCTs) of techniques intended to stimulate the P6 acupoint, compared 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, for trials that assessed acupressure wristbands, wristbands without studs placed at the P6 acupoint were considered as adequate sham treatment and these trials were included in the review.

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

Types of interventions—Techniques intended to stimulate the P6 acupoint: acupuncture, electro-acupuncture, laser acupuncture, transcutaneous electrical stimulation, an acu-stimulation device, acupressure, and capsicum plaster; 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 on the duration of P6 acupoint stimulation or when it was applied.

Types of outcome measures—We did separate meta-analyses for each of the following primary and secondary outcomes. Trials could report more than one primary or secondary outcome.

Primary outcomes

1. Risk of postoperative nausea.
2. Risks of 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 (for example 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. Risk of patients requiring a rescue antiemetic drug.
2. Risk of side effects.

Search methods for identification of studies

Electronic searches—We searched the following for relevant trials.

- The Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library*, Issue 3, 2008), in Appendix 1.
- Electronic databases: MEDLINE (January 1966 to September 2008), in Appendix 2; EMBASE (January 1988 to September 2008), in Appendix 3; ISI Web of Science (January 1965 to September 2008), in Appendix 4; and 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 combined the following MeSH and text words with the filters for identifying randomized controlled trials: 'postoperative complications', 'nausea and vomiting', 'acupuncture', 'acupuncture therapy', 'acupuncture points', 'acupressure', 'transcutaneous electric nerve stimulator', and 'electro-acupuncture'.

There was no language restriction. We excluded studies of P6 acupoint stimulation to treat established PONV, or to prevent intraoperative nausea or vomiting.

Searching other resources—We did not search for conference proceedings or seek unpublished trials. Grey literature has not been peer-reviewed and there is some evidence that it is of lower quality than published studies (McAuley 2000).

Data collection and analysis

We selected trials identified by our search that fulfilled our inclusion criteria. There was no disagreement between authors about inclusion and exclusion of studies for this review. We examined all selected trials for duplicate data; where we found duplication, we used the results of the main trial report. 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. We graded the risk of bias for each study in the domains of sequence generation; allocation concealment; blinding of participants, healthcare providers, and outcome assessors; incomplete outcome data; selective outcome reporting; and comparison of baseline characteristics for each group in a 'Risk of bias' table (Higgins 2008). We graded each domain as yes (low risk of bias), no (high risk of bias), or unclear (uncertain risk of bias) according to the criteria outlined in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins 2008).

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

We used the random-effects model to combine data, as we expected that the treatments and conditions in these trials would be heterogeneous. This model incorporates 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 I^2 statistic as a measure of 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 sequence generation, allocation concealment, blinding of outcome assessor (adequate versus inadequate or unclear), selective reporting (adequate versus inadequate or 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).

We used the contour-enhanced funnel plot to differentiate asymmetry due to publication bias from that due to other factors (Peters 2008), using STATA statistical software (Stata Corporation, College Station, Texas, version 10). Contour-enhanced funnel plots display the area of statistical significance on a funnel plot (Peters 2008) to improve the correct identification of the presence or absence of publication bias. This was used in conjunction with the 'trim and fill' method (Duval 2000) to inform the likely location of missing studies, using STATA statistical software (Stata Corporation, College Station, Texas, version 10), as suggested by Peters (Peters 2008). Publication bias would be expected when the usual funnel plot is asymmetrical but assessment of the contour-enhanced funnel plot indicates that missing studies are located where nonsignificant studies would be plotted (Peters 2008).

We estimated the number needed to treat (NNT) for different baseline risk for nausea and vomiting using the RR (Smeeth 1999) to assess whether P6 acupoint stimulation is worthwhile for individuals. We estimated the 95% CI around the number needed to treat using the method outlined by Altman (Altman 1998).

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies.

The search identified 67 trials of P6 acupoint stimulation for PONV. The flow chart (Figure 1) shows the results of the literature search (the number of hits) and the culling process to reduce the total to 40 included studies.

Included studies—We included 40 trials, involving 4858 participants, conducted between 1986 and 2008. All trials but one (Gieron 1993) were published in English. Most trials recruited healthy adults undergoing elective surgery. Seven trials recruited children (Butkovic 2005; Lewis 1991; Rusy 2002; Schlager 1998; Shenkman 1999; Wang 2002; Yentis 1992). One trial recruited both children and adults (Amir 2007). Most participants had general anaesthesia. Women having elective Caesarean delivery received spinal anaesthesia in four studies (Duggal 1998; Habib 2006; Harmon 2000; Ho 1996).

There were 10 types of P6 acupoint stimulation: needle acupuncture (Dundee 1986; Dundee 1989; Sharma 2007; Streitberger 2004; Yentis 1992); infiltration of dextrose (Tavlan 1996; Wang 2002; Yang 1993); semipermanent needles (Andrzejowski 1996); electrical stimulation of needles (Amir 2007; Dundee 1989; Ho 1989; Rusy 2002); transcutaneous electrical nerve stimulation (Fassoulaki 1993; Gan 2004; Habib 2006; Ho 1989); laser stimulation (Butkovic 2005; Schlager 1998); an acu-stimulation 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; Klein 2004; Lewis 1991; Samad 2003; Schultz 2003; Turgut 2007). Two studies used conventional peripheral nerve stimulation (Arnberger 2007; Liu 2008). One trial each used: both acupressure and acupuncture (Shenkman 1999); and a capsicum plaster (Misra 2005). The type of surgery; type, timing, and duration of stimulation of the P6 acupoint; and the follow-up time for assessing PONV varied greatly.

P6 stimulation was compared with five antiemetic drugs: metoclopramide (Butkovic 2005; Dundee 1989); cyclizine (Dundee 1989); prochlorperazine (Barsoum 1990; Ho 1989);

droperidol (Schultz 2003; Wang 2002; Yang 1993; Yentis 1992); and ondansetron (Agarwal 2002; Gan 2004; Misra 2005; Sharma 2007; Tavlan 1996; White 2002).

Excluded studies—We excluded 27 trials. Please see 'Characteristics of excluded studies' for more information.

Risk of bias in included studies

Allocation sequence was generated using a computer-generated random numbers table (Agarwal 2000; Arnberger 2007; Gan 2004; Harmon 1999; Ho 1996; Klein 2004; Misra 2005; White 2002; Zarate 2001), a table of random numbers (Agarwal 2002; Duggal 1998; Liu 2008; Samad 2003; Schultz 2003), a block design procedure (Rusy 2002), and a yoking randomization based on a computer-generated list (Wang 2002). Four of the 40 trials reported adequate allocation concealment (Arnberger 2007; Gan 2004; Schultz 2003; Streitberger 2004). In 34 trials the allocation concealment was unclear, and in one trial (Ferrara-Love 1996) it was inadequate. Patients were not blinded in one study (Sharma 2007) because acupuncture needles inserted before induction of anaesthesia had to be kept in situ in the operating room in two of the three intervention groups. There was no blinding of healthcare providers in two studies (Arnberger 2007; Sharma 2007). The outcome assessor was not blinded in two studies (Gieron 1993; Sharma 2007). Twelve trials did not report all four outcomes: postoperative nausea, postoperative vomiting, rescue antiemetic drugs, and adverse events in their studies (Alkaissi 1999; Allen 1994; Barsoum 1990; Butkovic 2005; Fassoulaki 1993; Ferrara-Love 1996; Habib 2006; Harmon 2000; Ho 1989; Lewis 1991; Schultz 2003; Yang 1993). All studies except one (Dundee 1989) reported the between-group comparisons of baseline characteristics. A 'Risk of bias' graph captures the review authors' judgements about each risk of bias item, presented as percentages across all included trials (Figure 2). A 'Risk of bias' summary captures the review authors' judgements about each risk of bias item for each included trial (Figure 3). There was one study with a low risk of bias (Gan 2004), as all key domains were rated 'Yes'. Of the 16 studies with a high risk of bias (one or more key domains were rated 'No'), 12 of these were due to selective reporting. The risk of bias in the remaining 23 studies was unclear.

Effects of interventions

See: Summary of findings for the main comparison; Summary of findings 2

P6 acupoint stimulation versus sham treatment

Nausea: (see Analysis 1.1)

Twenty-seven trials examined P6 acupoint stimulation for the prevention of nausea, in a total of 2962 participants (Analysis 1.1). P6 acupoint stimulation reduced the risk of nausea (RR 0.71, 95% CI 0.61 to 0.83) but there was moderate heterogeneity (I^2 = 60%) (Figure 4). The 'trim and fill' method did not trim or add any more studies to the contour-enhanced funnel plot (Figure 5). The estimated number needed to treat for different baseline risks of nausea is shown in 'Additional Table 1'.

There was no evidence of an interaction between the estimated effect of P6 stimulation and the sensitivity and subgroup analyses that were prespecified: adequate compared with unclear or inadequate sequence generation (Analyses 1.1.2, 1.1.3: z statistic −0.79, P = 0.43); allocation concealment (Analyses 1.1.4, 1.1.5: z statistic 0.32, P = 0.75); blinding of outcome assessor (Analyses 1.1.6, 1.1.7: z statistic −1.64, P = 0.10); selective reporting (Analyses 1.1.8, 1.1.9: z statistic −0.72, P = 0.47); control event rates ≤ 20% or more than 20% (Analyses 1.1.10, 1.1.11: z statistic 0.70, P = 0.48); children compared with adults

(Analyses 1.1.12, 1.1.13: z statistic −1.13, P = 0.26); invasive compared with noninvasive P6 acupoint stimulation (Analyses 1.1.14, 1.1.15: z statistic −0.63, P = 0.53).

Vomiting: (see Analysis 1.2)

Thirty-two trials examined P6 acupoint stimulation for the prevention of vomiting, in 3385 participants. P6 acupoint stimulation reduced the risk of vomiting (RR 0.70, 95%CI 0.59 to 0.83) but there was moderate heterogeneity (I^2 = 53%) (Figure 6). The 'trim and fill' method did not trim or add any more studies to the contour-enhanced funnel plot (Figure 7). The estimated number needed to treat for different baseline risks of vomiting is shown in 'Additional Table 1'.

There was no evidence of an interaction between the estimated effect of P6 stimulation and the prespecified sensitivity and subgroup analyses: adequate compared with unclear or inadequate sequence generation (Analyses 1.1.2, 1.1.3: z statistic 0.42, P = 0.68); allocation concealment (Analyses 1.1.4, 1.1.5: z statistic 0.25, P = 0.80); blinding of outcome assessor (Analyses 1.1.6, 1.1.7: z statistic 0, P = 1.00); selective reporting (Analyses 1.1.8, 1.1.9: z statistic 0.24, P = 0.81); control event rates ≤ 20% or more than 20% (Analyses 1.1.10, 1.1.11: z statistic 1.10, P = 0.27); children compared with adults (Analyses 1.1.12, 1.1.13: z statistic −0.41, P = 0.68); invasive compared with noninvasive P6 acupoint stimulation (Analyses 1.1.14, 1.1.15, z statistic −0.85, P = 0.40).

Rescue antiemetic: (Analysis 1.3)

The risk that a rescue antiemetic was required was less after P6 stimulation than after sham treatment (RR 0.69, 95% CI 0.57 to 0.83) (Figure 8). There was moderate heterogeneity (I^2 = 43%). Three trials did not specify the type of rescue antiemetic drug used (Alkaissi 2002; Duggal 1998; Ferrara-Love 1996). We included the data excluded by one trial for persistent vomiting (Fassoulaki 1993).

Side effects: Overall, the side effects associated with P6 acupoint stimulation were minor and self-limiting. No side effects were observed for patients receiving acupuncture (Dundee 1986; Dundee 1989; Sharma 2007); acupressure, in several trials (Agarwal 2000; Agarwal 2002; Gieron 1993; Harmon 1999; Ho 1996; Klein 2004; Lewis 1991); or transcutaneous electro-acupoint stimulation by a peripheral nerve stimulator (Liu 2008). Haematomas occurred in one patient in the acupuncture group and in two patients in the placebo acupuncture group (Streitberger 2004). Although no side effects were reported in associated with an acu-stimulation 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. One patient complained of mild irritation at the site of capsicum plaster application (Misra 2005).

P6 acupoint stimulation versus antiemetic drug

Nausea: (Analysis 2.1)

There was no difference in the risk of postoperative nausea for P6 acupoint stimulation compared to pooled antiemetic drugs (Analysis 2.1.6: RR 0.82, 95% CI 0.60 to 1.13) (Agarwal 2002; Dundee 1989; Gan 2004; Misra 2005; Schultz 2003; Sharma 2007; Tavlan

1996; Wang 2002; White 2002). There was minor heterogeneity between the trials (I^2 = 37%) (Figure 9). The 'trim and fill' method did not trim or add any more studies to the contour-enhanced funnel plot (Figure 10). The level of sequence generation modified the estimated effect of P6 stimulation on nausea (Analyses 2.1.7, 2.1.8: z statistic 2.02, P = 0.04). There was no evidence of any interaction between the estimated effect of P6 stimulation and the prespecified sensitivity and subgroup analyses: allocation concealment (Analyses 2.1.9, 2.1.10: z statistic 0.27, P = 0.79); blinding of outcome assessor (Analyses 2.1.11, 2.1.12: z statistic −1.03, P = 0.30); selective reporting (Analyses 2.1.13, 2.1.14: z statistic 0.15, P = 0.88).

Vomiting: (Analysis 2.2)

There was no difference in the risk of postoperative vomiting for P6 acupoint stimulation compared to pooled antiemetic drugs (Analysis 2.2.6: RR 1.01, 95% CI 0.77 to 1.31) (Agarwal 2002; Barsoum 1990; Butkovic 2005; Dundee 1989; Gan 2004; Ho 1989; Misra 2005; Schultz 2003; Sharma 2007; Tavlan 1996; Wang 2002; White 2002; Yang 1993; Yentis 1992). Trial results were homogeneous (I^2 = 0%) (Figure 11). The 'trim and fill' method did not trim or add any more studies to the contour-enhanced funnel plot (Figure 12). There was no evidence of an interaction between the effect of P6 stimulation and the prespecified sensitivity and subgroup analyses: sequence generation (Analyses 2.2.7, 2.2.8: z statistic −0.04, P = 0.97); allocation concealment (Analyses 2.2.9, 2.2.10: z statistic 0.64, P = 0.52); blinding of outcome assessor (Analyses 2.2.11, 2.2.12: z statistic −0.18, P = 0.86); selective reporting (Analyses 2.2.13, 2.2.14: z statistic −0.56, P = 0.58).

Rescue antiemetic: (Analysis 2.3)

There was no difference in the risk of requiring rescue antiemetics for P6 acupoint stimulation compared to pooled antiemetic drugs (RR 0.82, 95% CI 0.59 to 1.13) (Agarwal 2002; Butkovic 2005; Gan 2004; Misra 2005; Sharma 2007; Wang 2002; White 2002). Trial results were homogeneous (I^2 = 0%) (Figure 13).

Side effects: Restlessness was less frequent in the acupuncture group than after roperidol (RR 0.47, 95% CI 0.26 to 0.87) (Yentis 1992).

P6 acupoint stimulation and antiemetic combination versus sham—One trial examined this comparison (Schultz 2003). There was no difference between groups for the risk of nausea (RR 1.19, 95% CI 0.91 to 1.55) and vomiting (RR 1.18, 95% CI 0.63 to 2.21).

ADDITIONAL SUMMARY OF FINDINGS *[Explanation]*

Acupoint P6 stimulation versus sham to prevent postoperative nausea and vomiting						
Patient or population: patients with a desire to prevent postoperative nausea and vomiting						
Settings: Surgery						
Intervention: Acupoint P6 stimulation versus antiemetic						
Outcomes	**Illustrative comparative risks* (95% CI)**		**Relative effect (95% CI)**	**No of Participants (studies)**	**Quality of the evidence (GRADE)**	**Comments**
	Assumed risk	**Corresponding risk**				
	Control	**Acupoint P6 stimulation versus sham**				

Nausea - All antiemetics combined	**Low risk population**[1]		**RR 0.82** (0.6 to 1.13)	660 (9)	⊕⊕⊕○ **moderate**[2]
	100 per 1000	**82 per 1000** (60 to 113)			
	High risk population[1]				
	400 per 1000	**328 per 1000** (240 to 452)			
Vomiting - All antiemetics combined	**Low risk population**[1]		**RR 1.01** (0.77 to 1.31)	1036 (14)	⊕⊕⊕○ **moderate**[2]
	100 per 1000	**101 per 1000** (77 to 131)			
	High risk population[1]				
	400 per 1000	**404 per 1000** (308 to 524)			
Rescue antiemetic	**Medium risk population**		**RR 0.82** (0.59 to 1.13)	527 (7)	⊕⊕⊕○ **moderate**[2]
	180 per 1000	**148 per 1000** (106 to 203)			
Adverse effects[3]	**633 per 1000**	**298 per 1000** (165 to 551)	**RR 0.47** (0.26 to 0.87)	60 (1)	

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval; RR: Risk ratio;

GRADE Working Group grades of evidance
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1]No risk factors for postoperative nausea and vomiting typically have control rates of 10%; most studies in this systematic review had high risk patients with two or more risk factors for postoperative nausea and vomiting, therefore we assumed a risk of 40%.

[2]Total number of events is less than 300

[3]Restlessness was more frequent after droperidol group than after acupuncture.

DISCUSSION

We have shown that P6 acupoint stimulation reduces the risk of PONV compared to sham treatment. P6 acupoint stimulation prevented postoperative nausea, vomiting, and need for antiemetic rescue by similar amounts (RR 0.71, 95% CI 0.61 to 0.83; RR 0.70, 95% CI 0.59 to 0.83; RR 0.69, 95% CI 0.57 to 0.83, respectively). Reduction of nausea, vomiting, and need for rescue antiemetics with P6 acupoint stimulation may reduce costs (such as antiemetic drug cost, length of stay in hospital) as well as improve quality of patient care. Although the relative risks for nausea and vomiting in subgroup analyses were not significant for control rates ≤ 20%, but significant for >20%, the interactions were not significant; this suggests that the P6 acupoint stimulation effect was equal across subgroups. We did not find any interaction between the effect of P6 acupoint stimulation and age (children versus adults); type of P6 acupoint stimulation (invasive versus noninvasive); quality of sequence generation (adequate versus unclear or inadequate); quality of allocation concealment (adequate versus unclear or inadequate); blinding of outcome assessors (adequate versus unclear or inadequate); and selective reporting (free of versus unclear or

not free of). Therefore, the reasons for the moderate heterogeneity among the trials are not clear. The moderate heterogeneity may be due to differences in the intensity of P6 acupoint stimulation, differences in underlying risk, trials of different sizes (Egger 1997), or the different timing of the outcome measures.

The quality of the included trials was variable. The allocation concealment technique was adequate in only four of 40 trials whilst the generation of allocation sequence was adequate in 17 trials. Whether outcome assessors, investigators, and patients were blinded to the intervention was difficult to assess in four trials because of insufficient information. It is difficult to provide good sham treatments. There may be subtle differences between inactive ReliefBand (Habib 2006; White 2002; Zarate 2001) and SeaBands with studs removed (Barsoum 1990; Duggal 1998; Ferrara-Love 1996; Klein 2004), when placed over the P6 acupoint. Despite possible differences in sham efficacy and intrinsic bias we analysed these sham treatments in one group. Selective reporting was the main bias found in 12 of 40 trials. Althoughmeta-analyses excluding unpublished outcomes are likely to over-estimate P6 acupoint stimulation effects, we did not find any interactions between the effect of P6 acupoint stimulation and level of selective reporting. Therefore, the impact of selective reporting on the point estimates in this Cochrane review are likely to be minimal.

Publication bias may be common for RCTs of traditional Chinese medicine (Tang 1999). The contour-enhanced funnel plots for nausea and vomiting showed no evidence of publication bias. In contrast to our last Cochrane review (Lee 2004), we did not use Egger's test (Egger 1997) for funnel plot asymmetry because it is problematic (Higgins 2008). The addition of another 10 studies examining P6 acupoint stimulation versus sham for postoperative nausea since our previous Cochrane review (Lee 2004) did not change the relative risk estimate. If publication bias and a country effect on the results were present, we would have expected the relative risk of nausea to be no longer significant after adjusting for country effect (Lee 2006). Thus, we are confident that publication bias is minimal in this review.

We did not undertake a dose-response relationship analysis for P6 acupoint stimulation time and intervention effect. Although 18 trials had sufficient data on the duration of P6 acupoint stimulation on outcomes at 24 hours after surgery, none of them randomized participants to one timing (for example 6 hours duration) or another (such as 24 hours duration). Conclusions about differences in effect due to differences in dose are strongest if participants are randomized within a study to one dose or another and a consistent relationship is found across similar studies Higgins 2008). Also, many meta-regression analyses have low power to detect genuine relationships (Higgins 2008).

Comparing P6 acupoint stimulation to prophylactic antiemetic drugs, our previous Cochrane review (Lee 2004) showed a significant reduction in nausea (RR 0.70, 95% CI 0.50 to 0.98) but not in vomiting (RR 0.92, 95% CI 0.65 to 1.29). In this Cochrane review, after adding three small studies (< 100 participants each), we found no reliable evidence for differences in risk of postoperative nausea or vomiting after P6 acupoint stimulation compared to antiemetic drugs. For nausea, the RR was 0.82 (95%CI 0.60 to 1.13). Interestingly, the method of sequence generation modified the P6 acupoint stimulation effect; unclear or inadequate sequence generation over-estimated the effect on nausea. For vomiting, the RR was 1.01 (95% CI 0.77 to 1.31) with no significant risk of bias interactions. The wide confidence intervals around the point estimates for nausea and vomiting in this review suggest that we still have little knowledge about the effect size, and that further information is needed.

Whether P6 acupoint stimulation is a useful modality within multimodal prophylaxis of PONV remains unclear. This Cochrane review identified only one trial (Schultz 2003) that compared a combination of an antiemetic medication and P6 acupoint stimulation versus sham, with imprecise results.

AUTHORS' CONCLUSIONS

Implications for practice

Patients with a very high baseline risk of postoperative nausea and vomiting are more likely to benefit from P6 acupoint stimulation (Table 1). No major side effects were associated with P6 acupoint stimulation. The risks of postoperative nausea and vomiting were similar after P6 acupoint stimulation and antiemetic drugs. P6 acupoint stimulation may be a suitable alternative or addition to antiemetic drugs for preventing postoperative nausea and vomiting.

Implications for research

Further research is unlikely to reverse the conclusion that P6 acupoint stimulation, versus sham, reduces the risk of PONV but it is likely to alter confidence in the effect, and possibly the point estimate. Further research should investigate whether the duration of P6 acupoint stimulation alters its effect on PONV. Future research should also examine whether combinations of interventions (that is multimodal prophylaxis) works better than each component alone and whether they interact. This updated systematic review found one small study (Schultz 2003) examining the combined effect of P6 acupoint stimulation administered with an antiemetic drug. Compared to sham, there was no significant reduction in PONV associated with the combined effect of P6 acupoint stimulation and droperidol (Schultz 2003). Patients receiving acu-stimulation and ondansetron in combination had a higher quality of recovery than those receiving ondansetron alone but there was no difference in the risk of PONV (White 2002). Therefore, the effect of combining P6 acupoint stimulation with an antiemetic medication is inconclusive and larger, rigorous trials are needed. More importantly, future trials should use adequate allocation concealment and include clinically relevant outcomes, such as quality of recovery, to draw meaningful conclusions.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Appendix 1

Search strategy for CENTRAL, *The Cochrane Library*

1MeSH descriptor postoperative complications explode all trees

2MeSH descriptor Postoperative Nausea and Vomiting explode all trees

3MeSH descriptor nausea explode all trees

4MeSH descriptor vomiting explode all trees

5(nausea in All Text or vomiting in All Text)

6(#1 or #2 or #3 or #4 or #5)

7MeSH descriptor acupuncture explode all trees

8MeSH descriptor acupuncture therapy explode all trees

9MeSH descriptor acupuncture points explode all trees

10MeSH descriptor acupressure explode all trees

11MeSH descriptor Transcutaneous Electric Nerve Stimulation explode all trees

12MeSH descriptor electroacupuncture explode all trees

13(electroacupuncture in All Text or electro-acupuncture in All Text)

14acupressure in All Text

15acupunct* in All Text

16(nerve in All Text near/6 stimulat* in All Text)

17(#7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16) #18(#6 and #17)

Appendix 2

Search strategy for SilverPlatter MEDLINE (WebSPIRS)

1 explode Postoperative Complications / all subheadings

2 explode Postoperative Nausea / all subheadings and Vomiting

3 explode nausea / all subheadings

4 explode vomiting/ all subheadings#5 nausea or vomiting or emesis

6 #1 or #2 or #3 or #4 or #5

7 explode acupuncture / all subheadings

8 explode acupuncture therapy / all subheadings
9 explode acupuncture points/ all subheadings
10 explode acupressure/ all subheadings
11 explode Transcutaneous Electric Nerve Stimulation / all subheadings
12 explode electroacupuncture / all subheadings
13 electro?acupunct*
14 acupressure
15 acupunct*
16 electro* near nerv* near stimulat*
17 electro* near (nerv* and stimulat*)
18 #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17
19 #6 and #18
20 CLINICAL-TRIAL in PT
21 randomized in AB
22 placebo in AB
23 (clinical trials) in MESH
24 randomly in AB
25 trial in TI
26 #20 or #21 or #22 or #23 or #24 or #25
27 TG=animals
28 TG=humans
29 #27 not (#27 and #28)
30 #26 not #29
31 #19 and #30

Appendix 3

Search strategy for SilvePlatter EMBASE (WebSPIRS)

1 explode postoperative complication / all subheadings
2 explode postoperative nausea / all subheadings
3 explode postoperative nausea / all subheadings and vomiting
4 explode postoperative vomiting / all subheadings
5 explode nausea / all subheadings
6 explode vomiting / all subheadings
7 explode nausea / all subheadings and vomiting
8 nausea or vomiting or emesis

9 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8

10 explode acupuncture / all subheadings

11 explode acupuncture analgesia / all subheadings

12 explode electroacupuncture / all subheadings

13 explode acupressure / all subheadings

14 explode transcutaneous nerve stimulation / all subheadings)

15 acupressure or acupunct* or electro?acupunct*

16 electro* near (nerv* near stimulat*)

17 electro* near (nerv* and stimulat*)

18 #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17

19 #9 and #18

20 “RANDOMIZED-CONTROLLED-TRIAL”/ all subheadings

21 “RANDOMIZATION”/ all subheadings

22 “CONTROLLED-STUDY”/ all subheadings

23 “MULTICENTER-STUDY”/ all subheadings

24 “PHASE-3-CLINICAL-TRIAL”/ all subheadings

25 “PHASE-4-CLINICAL-TRIAL”/ all subheadings

26 “DOUBLE-BLIND-PROCEDURE”/ all subheadings

27 “SINGLE-BLIND-PROCEDURE”/ all subheadings

28 #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27

29 (RANDOM* or CROSS?OVER* or FACTORIAL* or PLACEBO* or VOLUNTEER*) in TI,AB

30 (SINGL* or DOUBL* or TREBL* or TRIPL*) near ((BLIND* or MASK*) in TI,AB)

31 #28 or #29 or #30#32 HUMAN in DER#33 (ANIMAL or NONHUMAN) in DER

34 #32 and #33

35 #33 not #34

36 #31 not #35

Appendix 4

Search strategy for ISI Web of Science

1.TS=pos$toperative complication*

2.TS=nausea OR TS=vomiting OR TS=emesis

3. #2 OR #1

4.TS=acupunct* OR TS=electro$acupunct* or TS=acupressure

#	5.TS=(electro* OR transcutaneous) AME TS=(nerv* AND stimulat*)
#	6.#5 OR #4
#	7.TS=(random* or clinical or control* or multi$cent*) SAME TS=(trial* or stud*)
#	8.TS=(singl* or doubl* or trebl* or tripl*) SAME TS=(blind* or mask* or method*)
#	9.TS=(random* or allocat* or compar* or factorial* or follow$up or placebo* or prospective
#	10.#9 OR #8 OR #7
#	11. #10 AND #6 AND #3

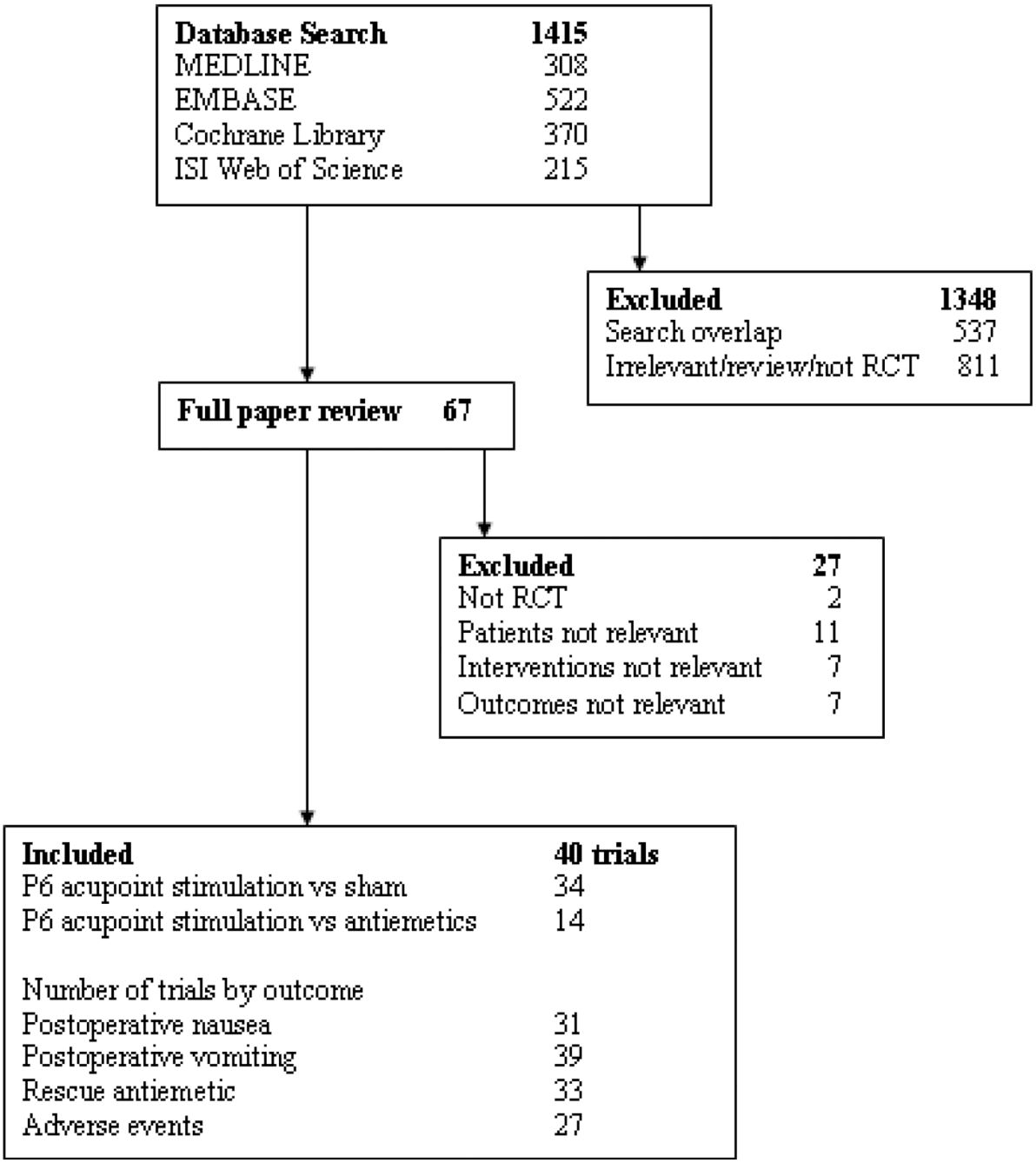

Figure 1.
Searching results

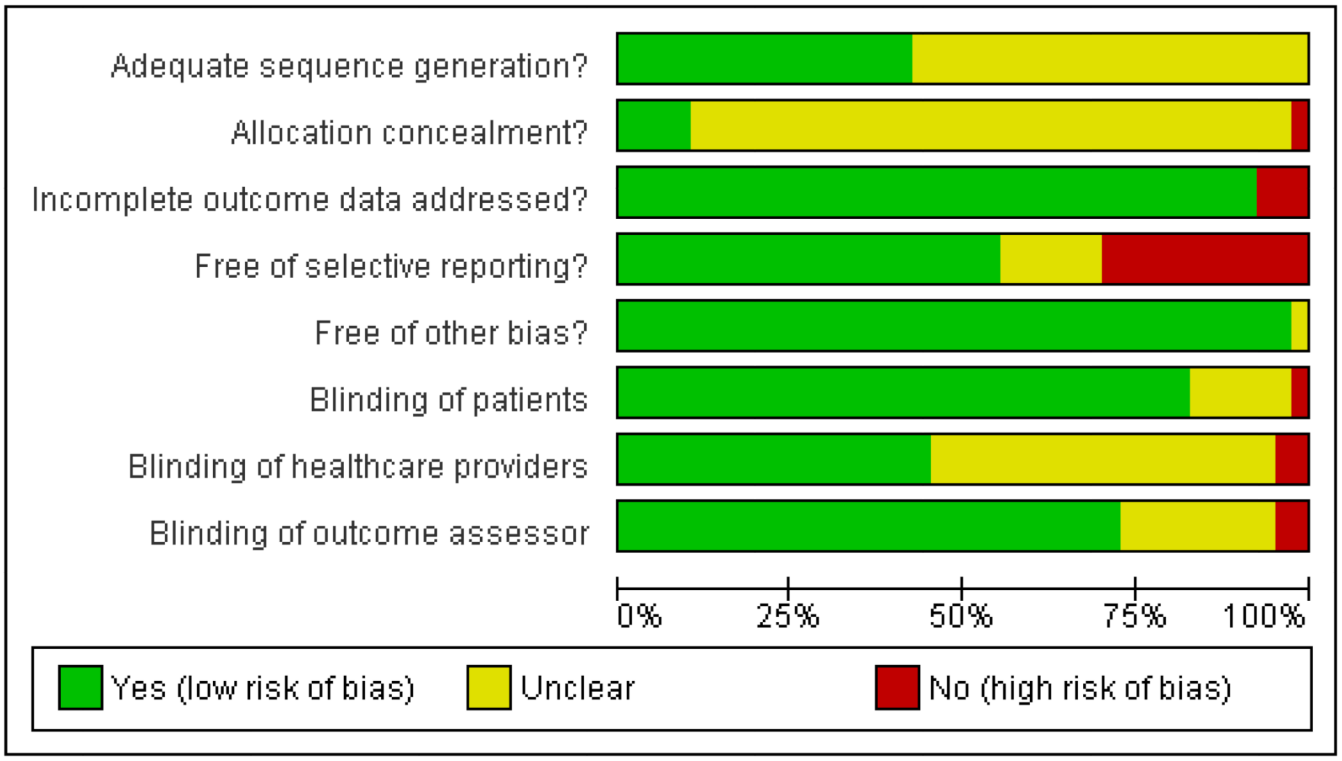

Figure 2.
Methodological quality graph: review authors' judgements about each methodological quality item presented as percentages across all included studies.

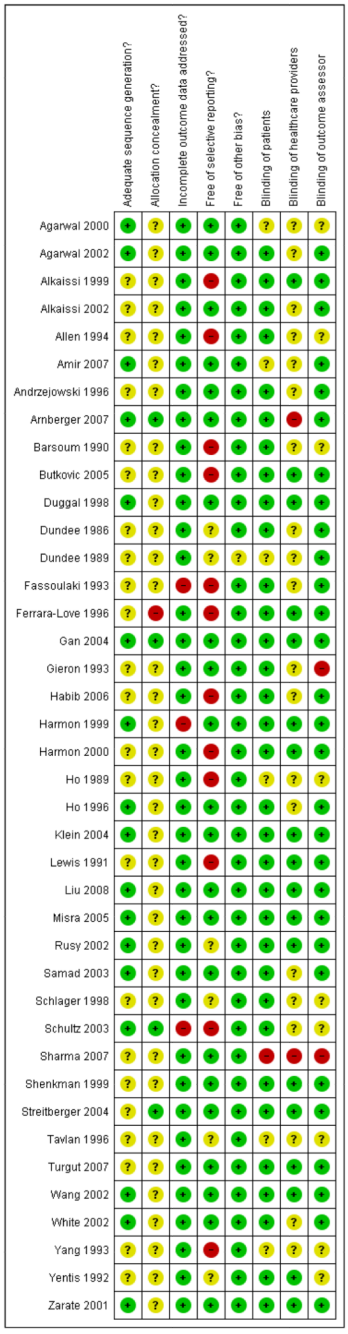

Figure 3.
Methodological quality summary: review authors' judgements about each methodological quality item for each included study.

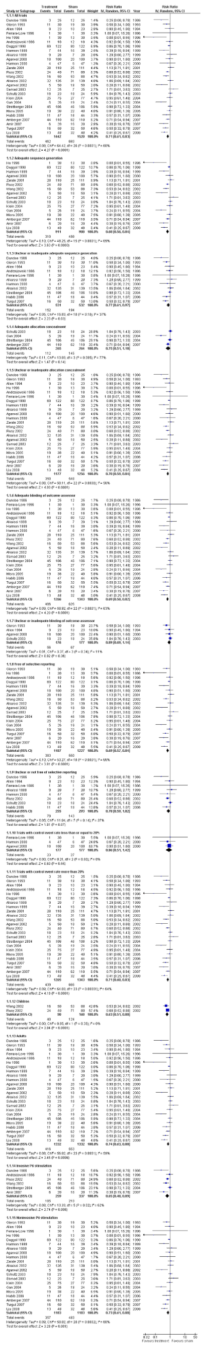

Figure 4.
Forest plot of comparison: 1 Acupoint P6 stimulation versus sham, outcome: 1.1 Nausea.

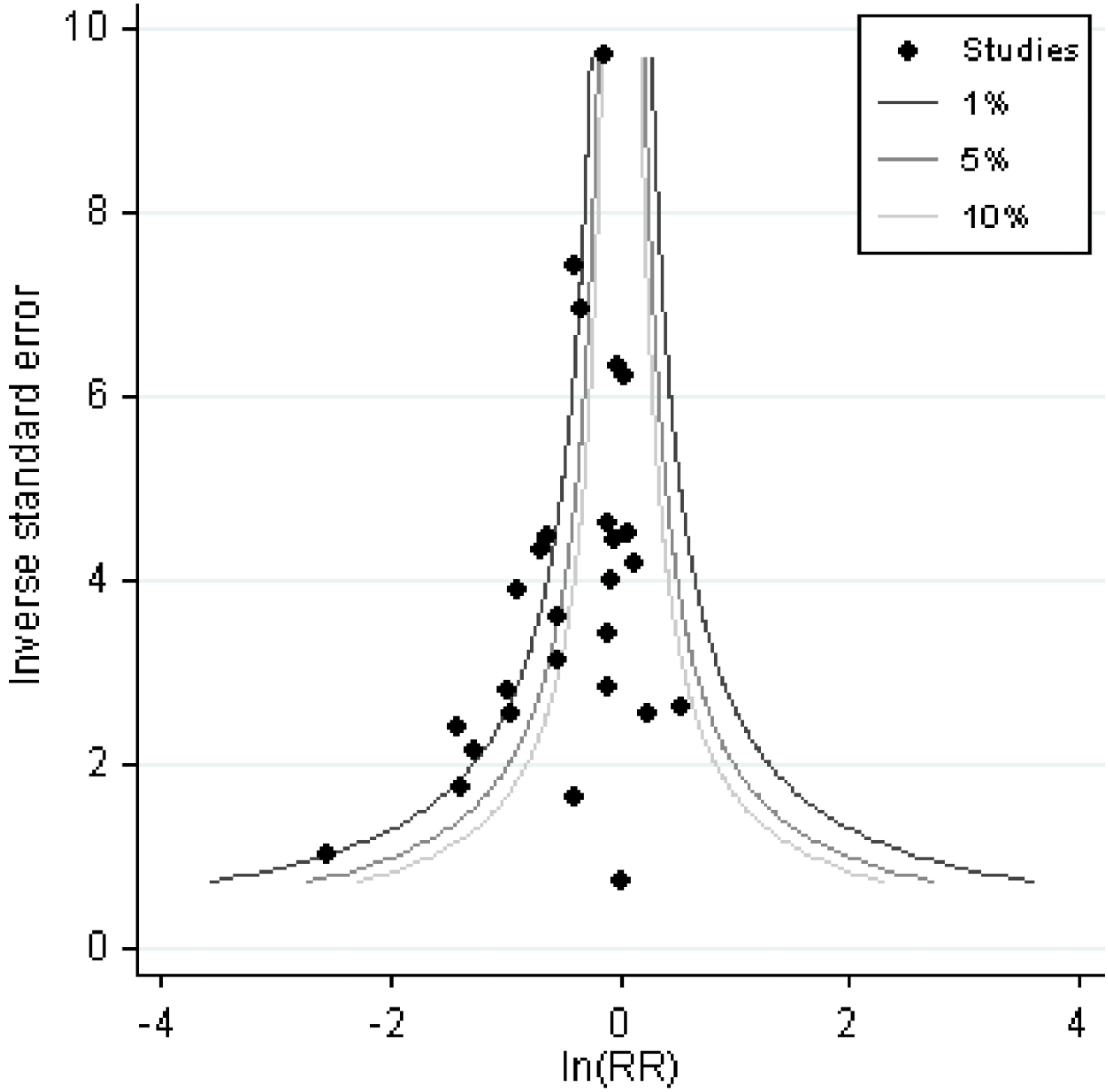

Figure 5.
Contour-enhanced funnel plot of comparison: 1 Acupoint P6 stimulation versus sham, outcome: 1.1 Nausea. Contour lines are at 1%, 5% and 10% levels of statistical significance.

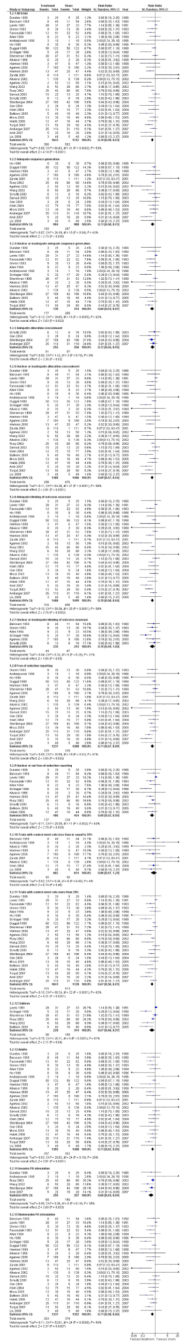

Figure 6.
Forest plot of comparison: 1 Acupoint P6 stimulation versus sham, outcome: 1.2 Vomiting.

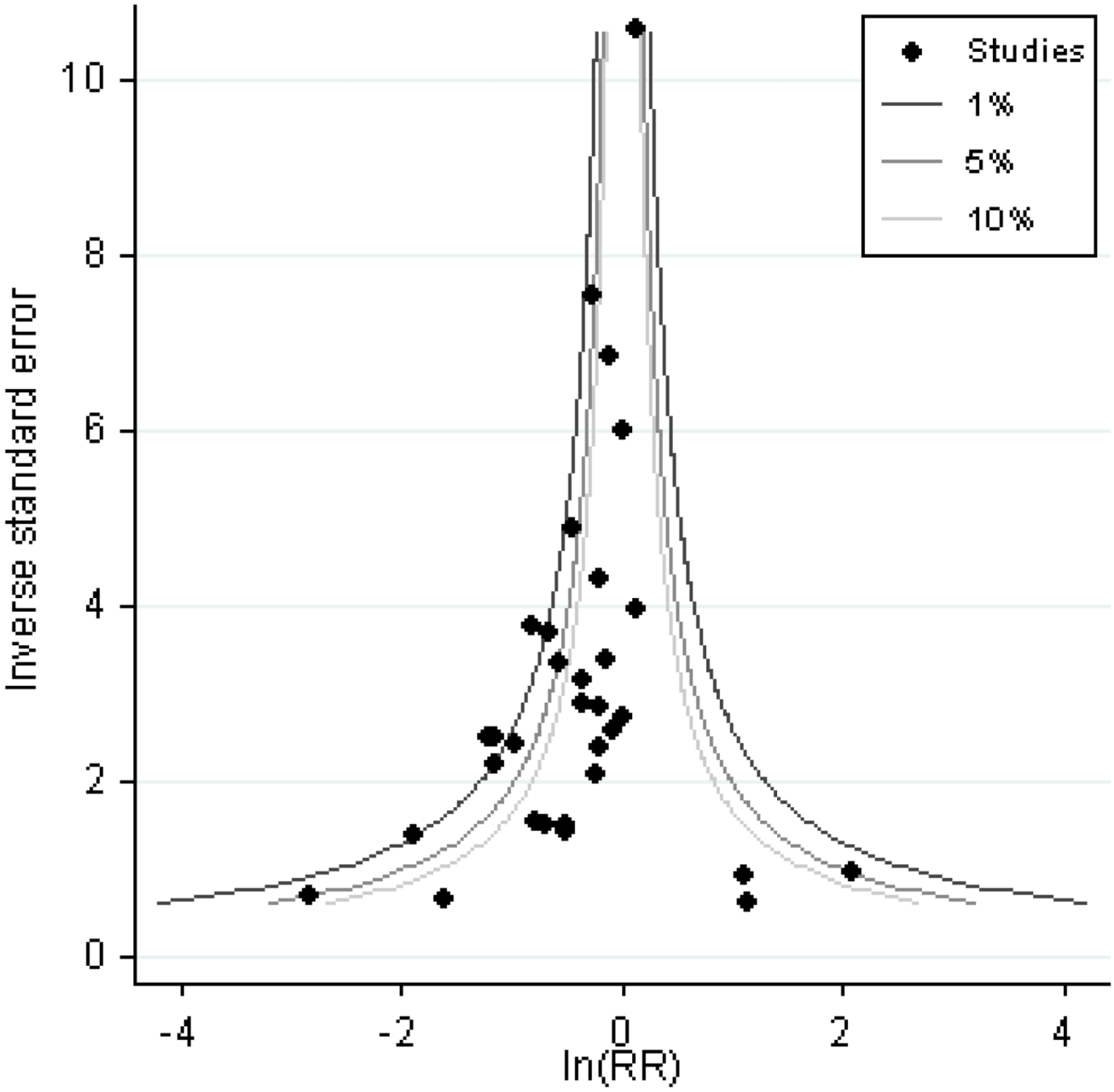

Figure 7.
Contour-enhanced funnel plot of comparison: 1 Acupoint P6 stimulation versus sham, outcome: 1.2 Vomiting. Contour lines are at 1%, 5% and 10% levels of statistical significance.

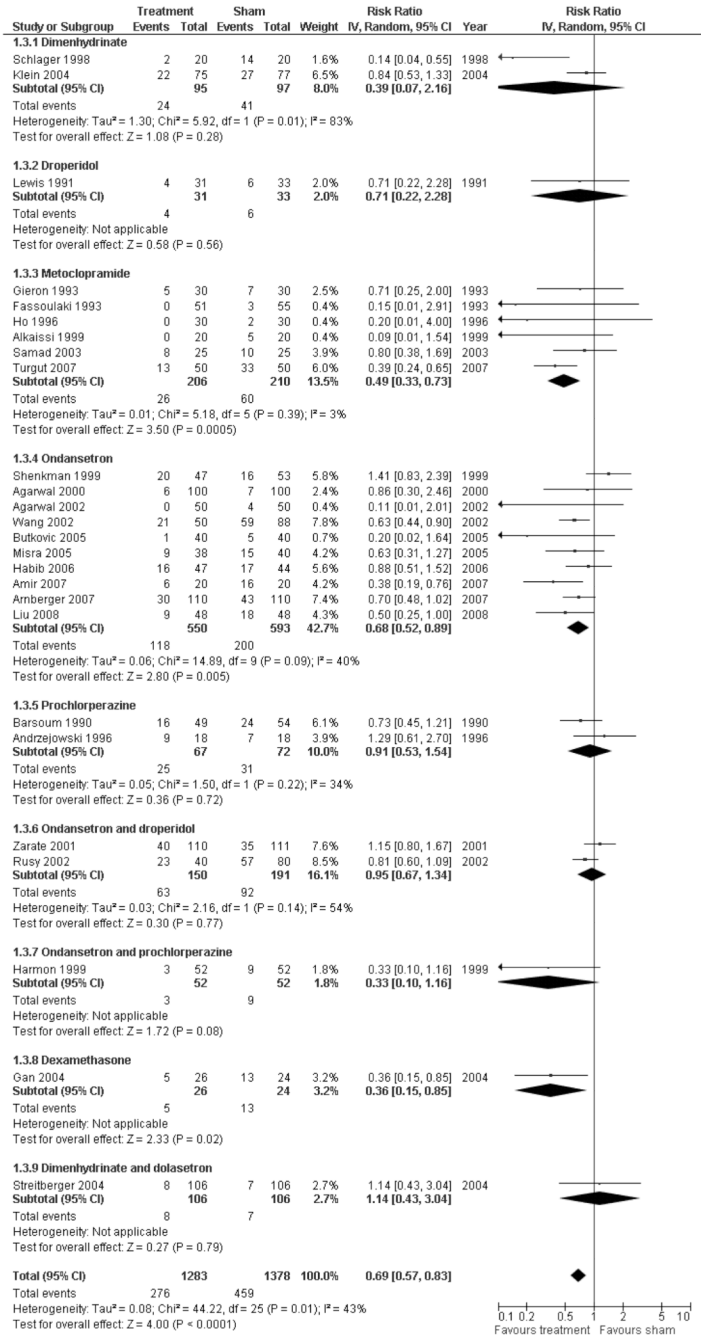

Figure 8.
Forest plot of comparison: 1 Acupoint P6 stimulation versus sham, outcome: 1.3 Rescue antiemetics.

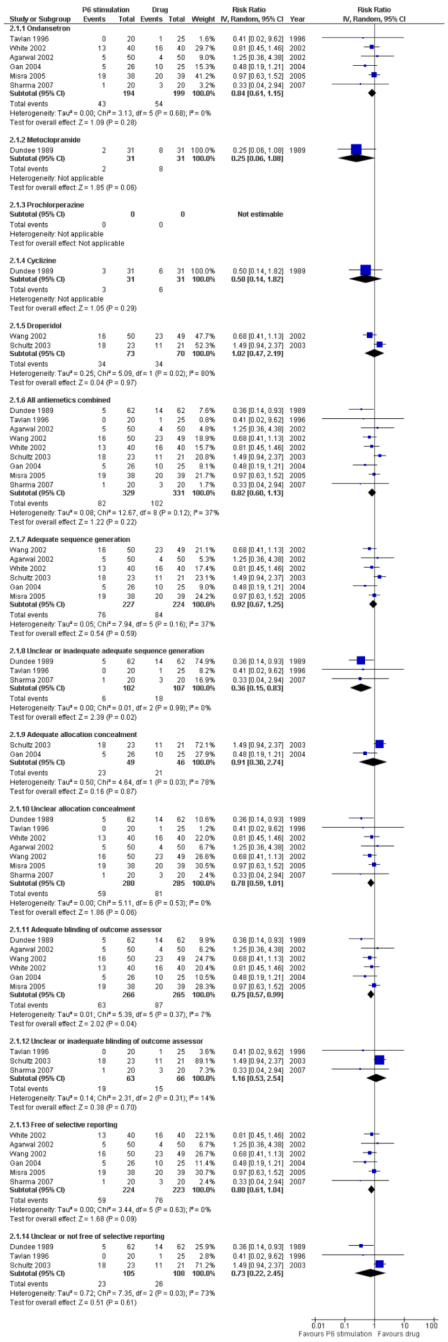

Figure 9.
Forest plot of comparison: 2 Acupoint P6 stimulation versus antiemetic, outcome: 2.1 Nausea.

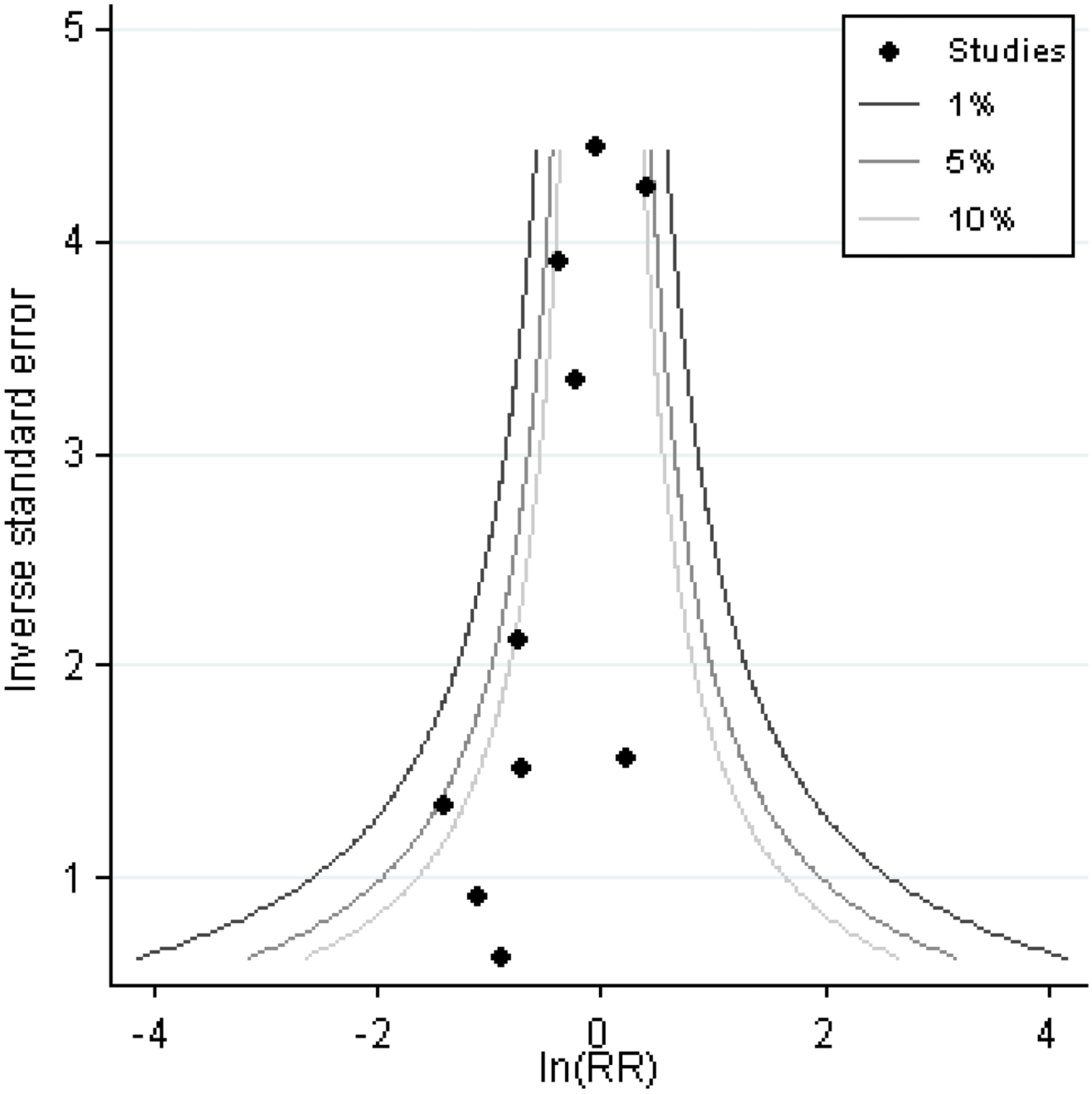

Figure 10.
Contour-enhanced funnel plot of comparison: 2 Acupoint P6 stimulation versus antiemetic, outcome: 2.1 Nausea. Contour lines are at 1%, 5% and 10% levels of statistical significance.

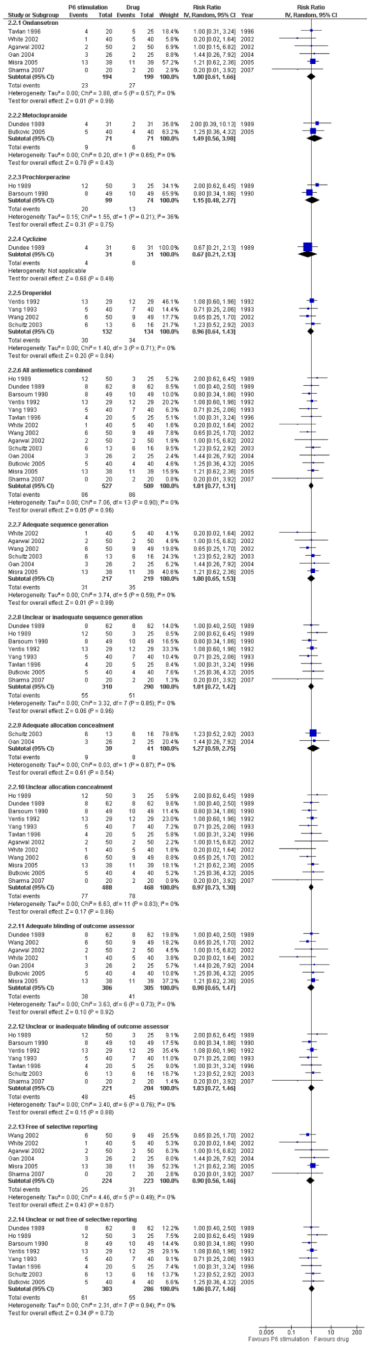

Figure 11.
Forest plot of comparison: 2 Acupoint P6 stimulation versus antiemetic, outcome: 2.2 Vomiting.

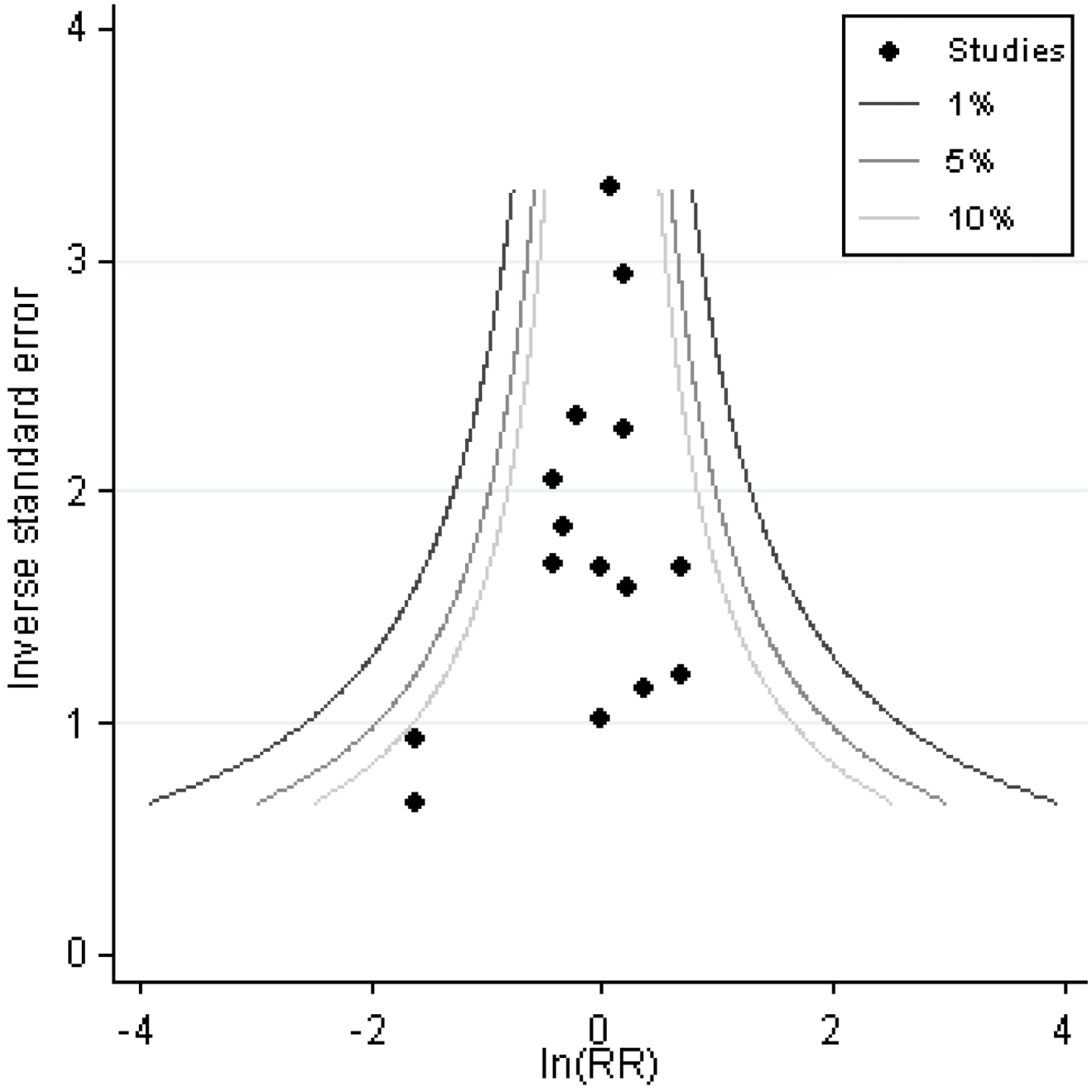

Figure 12.
Contour-enhanced funnel plot of comparison: 2 Acupoint P6 stimulation versus antiemetic, outcome: 2.2 Vomiting. Contour lines are at 1%, 5% and 10% levels of statistical significance.

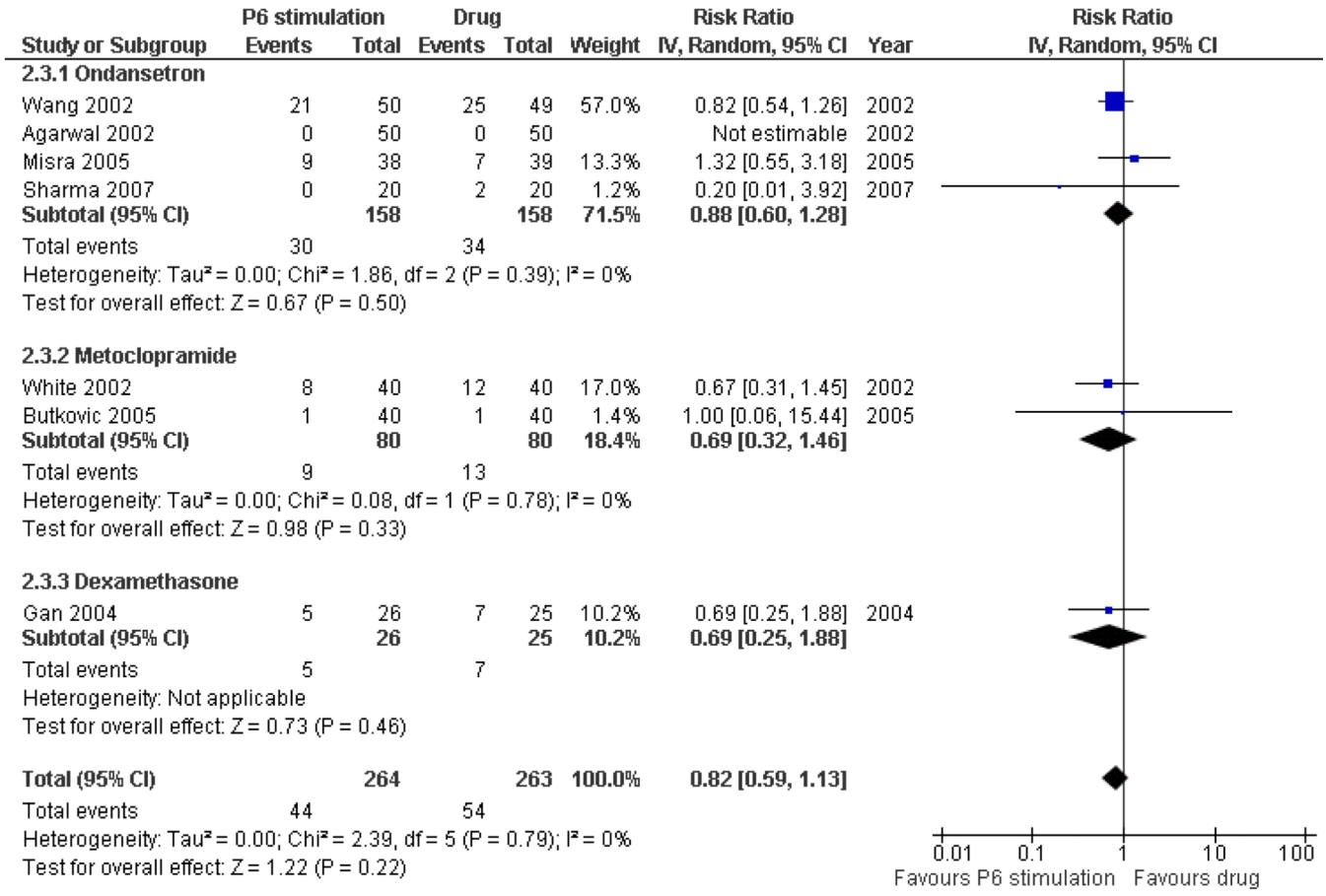

Figure 13.

Forest plot of comparison: 2 Acupoint P6 stimulation versus antiemetic, outcome: 2.3 Rescue antiemetic.

Table 1

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

Control event rate	Nausea	95% CI	Vomiting	95% CI
10%	34	26 to 59	33	24 to 59
20%	17	13 to 29	17	12 to 29
30%	11	9 to 20	11	8 to 20
40%	9	6 to 15	8	6 to 15
50%	7	5 to 12	7	5 to 12
60%	6	4 to 10	6	4 to 10
70%	5	4 to 8	5	3 to 8
80%	4	3 to 7	4	3 to 7
90%	4	3 to 7	4	3 to 6

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

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, risk of rescue antiemetic drug.	
Notes	Rescue antiemetic was ondansetron 4 mg IV. No side effects or complications noted in either group.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	"Patients were assigned to two different groups according to a computer-generated table of random numbers".
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	"No patient was excluded after admission to the study".
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable: "Patients were comparable in both the groups as regards to age, sex, height and weight".
Blinding of patients? All outcomes	Unclear	Insufficient information.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Unclear	Insufficient information.
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), risk of rescue antiemetic drug.	
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.	
Risk of bias		

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	"Patients were randomized into three groups of 50 each using a table of random numbers..".
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for 150 patients randomized.
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable: "Patients were comparable in both the groups as regards to age, sex, height, weight and duration of surgery".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Yes	"The incidence of PONV was evaluated by a blinded observer".
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 randomising 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), risk of rescue antiemetic drugs.	
Notes	Rescue antiemetics were metoclopramide 10 mg IV at patient's request; if not effective, then given droperidol 1.25 mg IV. Reference group received no treatment and was not included in data analysis.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	Reasons were given for 10 dropouts, who were replaced by randomising another 10 patients at the end of the study. "The dropouts were evenly distributed between the groups." No missing data reported for 60 patients analysed.
Free of selective reporting?	No	Primary outcome (PONV) reported. Description of side effects not given.
Free of other bias?	Yes	Demographic data appeared to be comparable in Table 1.
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Yes	"The nurses who asked the patients about nausea, and administered antiemetics on the postoperative ward were not aware of which treatment the patient received or where the P6 acupoint is located".
Blinding of outcome assessor? All outcomes	Yes	"The nurses who asked the patients about nausea, and administered antiemetics on the postoperative ward were not aware of which treatment the patient received

		or where the P6 acupoint is located". These nurses also noted vomiting episodes.
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, risk of rescue antiemetic (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.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	Reasons were given for 30 dropouts, who were replaced by randomizing another 30 patients at the end of the study. "Withdrawals were evenly distributed between the groups." No missing data reported for 410 patients analysed.
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Demographic data appeared to be comparable in Table 2.
Blinding of patients? All outcomes	Yes	"The wrists were wrapped for blinding". Patients reported outcomes.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Yes	"The wrists were wrapped for blinding". Patients reported outcomes.
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 elasticised wristbands for the prevention of motion sickness.	
Interventions	Acupressure wristband placed on P6 point of 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).	
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).	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficient information.

Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	"No patient refused to participate in the study, nor were there any withdrawals".
Free of selective reporting?	No	Risk of rescue antiemetic drug (one or more dose) was not given in the results. Description of side effects not reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "The ages and weights of the patients in the two groups were comparable..".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar in patients with no previous experience with this form of acupressure.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Unclear	Insufficient information.
Amir 2007		
Methods	Method of allocation concealment was not given. Subjects were randomly assigned to groups using computer-generated random number table. Outcome assessor was blinded but no details about blinding for subjects and attending anaesthetist.	
Participants	40 children and adults undergoing middle ear surgery. Patients with cardiovascular disease, central nervous system problems, previous history of PONV and/or motion sickness, and smokers were excluded. No details about withdrawals or loss to follow up.	
Interventions	Group 1: electro-acupuncture at frequency of 4 Hz and current intensity increased to a degree just less than what caused discomfort, given 20 min before induction for duration of surgery. Group 2: sham electro-acupuncture. No details given except that patients experienced needle pricks.	
Outcomes	Nausea (0–24h), vomiting (0–24h), risk of rescue antiemetic drug (0–24h), risk of adverse effects.	
Notes	Rescue antiemetic was ondansetron 4 mg IV after first episode of PONV and repeated when necessary at 6 hourly intervals. No side effects in sham electro-acupuncture group. Erythema occurred in 3 patients in the electro-acupuncture group.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	"Informed consent was taken from the selected patients and they were divided into two groups of twenty each using a computer-generated table of random numbers".
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for the 20 patients randomized.
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "Differences in mean age, weight, sex and duration of surgery were statistically insignificant".
Blinding of patients? All outcomes	Unclear	Insufficient information.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Yes	"A blinded observed collected postoperative data of PONV".
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 until second postoperative day. Sham semipermanent acupuncture needle inserted in sham point 20 min before induction, left in place until second postoperative day.
Outcomes	Nausea (0–8h), vomiting (0–8h), risk of antiemetic rescue drug, side effects.
Notes	Antiemetic rescue was prochlorperazine 12.5 mg IM when necessary. No side effects reported with interventions.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Insufficient information. "Patients were allocated randomly into one of two groups".
Allocation concealment?	Unclear	Insufficient information. "This was achieved by concealing the assignment schedule in sealed envelopes which were opened by the investigator just before inserting the needles". Comment: not sure if envelopes were sequentially numbered and opaque.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for 36 patients randomized.
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "There was no significant difference between the two groups in age, weight, total morphine consumed, or duration of anaesthesia".
Blinding of patients? All outcomes	Yes	The assessments were made by the patients, who were blinded to their treatment".
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Yes	The assessments were made by the patients, who were blinded to their treatment".

Arnberger 2007

Methods	Patients were assigned to groups using a set of computer-generated random numbers. The assignments were kept in sealed, sequentially numbered envelopes. Patients and outcome assessors were unaware of group assignment. The attending anaesthetist could not be blinded to the group assignment but was not involved in outcome assessments.
Participants	220 females undergoing elective gynaecological and abdominal laparoscopic surgery of more than 1 hour duration. Exclusion: pregnant and breast-feeding women, and patients with eating disorders, obesity (body mass index > 35kg/m^2), severe renal or liver impairment, central nervous system injury, vertebrobasilar artery insufficiency, vestibular disease, cytostatic therapy, and preoperative vomiting or antiemetic therapy. No patient withdrew from study.
Interventions	P6 group: during anaesthesia, neuromuscular blockade was monitored by a conventional nerve stimulator at a frequency of 1Hz over the median nerve (first electrode 1 cm proximal to P6 acupoint and second electrode placed 2 cm distal to the P6 acupoint) on the dominant hand. Sham group: during anaesthesia, neuromuscular blockade was monitored by a conventional nerve stimulator at a frequency of 1Hz over the ulnar nerve (first electrode 1 cm proximal to the point at which the proximal flexion crease of the wrist crosses the radial side of the tendon to the flexor carpi ulnaris muscle at the volar side of the wrist and second electrode placed 3 cm proximal to the distal electrode) on the dominant hand.
Outcomes	Nausea (0–24h), vomiting (0–24h), risk of rescue antiemetic drug (0–24h), risk of adverse effects.
Notes	Rescue antiemetic was ondansetron 4 mg IV if 2 or more episodes of vomiting or persistent nausea; with repetition after 2 hours. No local irritation, redness, contact dermatitis or muscle ache (side effects) were recorded. Nausea (0–6h), vomiting (0–6h), and incidence of rescue antiemetic (0–6h) also reported.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	"After induction of anaesthesia, patients were assigned to one of two groups using a set of computer-generated random numbers".

Allocation concealment?	Yes	"The assignments were kept in sealed, sequentially numbered envelopes until used, and the envelope numbers with the assignment were recorded".
Incomplete outcome data addressed? All outcomes	Yes	"Two hundred twenty patients were recruited for this study without any dropout over the observation period".
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "Demographic and morphometric characteristics and factors likely to influence PONV were similar in the two groups (Table 1)".
Blinding of patients? All outcomes	Yes	"Patients and PONV evaluators were not informed of the group assignments".
Blinding of healthcare providers? All outcomes	No	"The attending anaesthesiologist could not be blinded to the group assignment, but he or she was not involved with the PONV assessment".
Blinding of outcome assessor? All outcomes	Yes	"Patients and PONV evaluators were not informed of the group assignments".
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 (exact duration of intervention in hours not reported).	
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 of 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), risk of rescue antiemetic (prochlorperazine).	
Notes	Nausea scores were reported for those patients who could not eat. Number of patients who were free of nausea was not given. Vomiting on postoperative day 2 and 3 also reported. Four patients reported some local tightness and discomfort (one of these experienced carpal tunnel like symptoms).	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	Reasons for withdrawals were given. No missing data reported for the 152 patients analysed.
Free of selective reporting?	No	Severity of nausea was reported but risk of nausea was not.
Free of other bias?	Yes	Baseline characteristics appeared to be comparable. "It can be seen that the groups were comparable with regard to the range of operation and anaesthetic agents used".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar and all patients were told that they were wearing wristbands to try to prevent PONV.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Unclear	Insufficient information.
Butkovic 2005		

Methods	Method of allocation concealment not given. “Researchers were double-blinded” but no specific details about how blinding was achieved.
Participants	120 children (5–14 years) undergoing hernia repair, circumcision, or orchidopexy. Exclusion: patients predisposed to nausea and vomiting secondary to gastroesophageal reflux, motion sickness, and inner ear or central nervous system disorders.
Interventions	Group 1: laser acupuncture on P6 acupoint bilaterally for 1 min, 15 min before induction of anaesthesia and IV infusion of saline. Group 2: metoclopramide 0.15mg/kg IV and sham laser on P6 acupoint bilaterally for 1 min, 15 min before induction of anaesthesia. Group 3: sham laser stimulation on P6 acupoint bilaterally for 1 min, 15 min before induction of anaesthesia and saline infusion.
Outcomes	Vomiting (0–2h), risk of rescue antiemetic drug.
Notes	Rescue antiemetic was ondansetron 0.1 mg/kg IV if vomiting was severe.

Risk of bias

Item	**Authors’ judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for the 120 children analysed.
Free of selective reporting?	No	Description of side effects not included. Nausea not reported because it may be difficult to assess in children.
Free of other bias?	Yes	Baseline characteristics were comparable. “Demographic data showed no significant difference among groups”.
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make intervention appear similar.
Blinding of healthcare providers? All outcomes	Yes	“Researchers were double-blinded” but no specific details about how blinding was achieved. Comment: probably done.
Blinding of outcome assessor? All outcomes	Yes	“Researchers were double-blinded” but no specific details about how blinding was achieved. Comment: probably done.

Duggal 1998

Methods	A table of random numbers was used to allocate patients into 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), risk of rescue antiemetic (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.

Risk of bias

Item	**Authors’ judgement**	**Description**
Adequate sequence generation?	Yes	“A table of random numbers was used to allocate patients to one of two groups”.

Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	Reasons for withdrawals were given. No missing data reported for the 244 patients analysed.
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "Demographic analysis revealed no statistically significant difference between subjects in the two groups (Table 1)".
Blinding of patients? All outcomes	Yes	"The nature of the bands was therefore unknown to the patient, anaesthetist and investigators for the duration of the study".
Blinding of healthcare providers? All outcomes	Yes	"The nature of the bands was therefore unknown to the patient, anaesthetist and investigators for the duration of the study".
Blinding of outcome assessor? All outcomes	Yes	"The nature of the bands was therefore unknown to the patient, anaesthetist and investigators for the duration of the 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.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for 75 patients analysed.
Free of selective reporting?	Unclear	No details about the use of rescue antiemetic in anaesthetic protocol. The risk of rescue antiemetic drug not reported.
Free of other bias?	Yes	"The groups were comparable in average age, weight, and duration of anaesthesia".
Blinding of patients? All outcomes	Yes	The authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Yes	"Their assessments were performed by an observer who was unaware of which patients had undergone acupuncture".

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 reported 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). According to the authors, there were no side effects associated with acupuncture groups but some patients complained of drowsiness following antiemetic drug administration. For data analyses, manual acupuncture group was compared with cyclizine, and electroacupuncture group was compared with metoclopramide.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for 155 patients analysed.
Free of selective reporting?	Unclear	No details about the use of rescue antiemetic in anaesthetic protocol. The riisk of rescue antiemetic drug not reported.
Free of other bias?	Unclear	Demographic comparisons between groups were not given.
Blinding of patients? All outcomes	Unclear	Insufficient information.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Yes	"Patients were visited at 1 h and 6 h after operation by a person who was unaware of the preoperative treatment".

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 was included for risk of rescue antiemetic given 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, risk of 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).

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	No	"Three patients, originally assigned to the control groups, who received postoperatively metoclopramide because of persistent vomiting were eliminated from further vomiting evaluation and consequently from the study". Comment: may introduce clinically relevant bias in summary effect measure.

Free of selective reporting?	No	Nausea and side effects were not reported.
Free of other bias?	Yes	Baseline characteristics were comparable. “The two groups did not differ in age, body weight, duration of anaesthesia, and duration of surgery (Table 1)”.
Blinding of patients? All outcomes	Yes	“The stimulator, active or inactive, was covered with dark plastic bags, not allowing distinction between active and inactive stimulators”.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Yes	Vomiting was assessed by “an independent observer who was unaware of the patient randomization and of TENS treatment”.
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 randomisation 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, risk of rescue antiemetic drugs in the operating room if nausea persisted and/or emesis occurred.	
Notes	No treatment group excluded from data analysis. No cumulative outcome data.	
Risk of bias		
Item	**Authors’ judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	No	“Randomization was done by birth date with even numbered months and days assigned to the treatment group, odd months and days assigned to the placebo group and combinations of even/odd months and days assigned to the control group”.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for the 90 patients analysed.
Free of selective reporting?	No	Risk of vomiting and side effects were not reported in the results.
Free of other bias?	Yes	Baseline characteristics were comparable. “There were no differences between groups in demographic and perioperative variables” as tested using appropriate univariate statistical tests.
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Yes	PACU staff were blinded.
Blinding of outcome assessor? All outcomes	Yes	“Incidence of postoperative nausea and vomiting was documented by the PACU staff who were blinded as to treatment and placebo group”.
Gan 2004		
Methods	Randomization by random number generator in a sealed envelope technique. To maintain patient blinding, sham surface electrodes placed on P6 bilaterally but electrical stimulation unit not turned on. Electrical stimulation unit screen was covered with an opaque tape in all groups so that clinicians, research personnel, and patients were unaware if the unit was on or off. Study medication prepared by pharmacists, not involved in study. Postoperative data collected by research nurse not involved in management of patients.	

Participants	77 patients undergoing major breast surgery. Exclusion: pregnancy, using permanent cardiac pacemaker, previous experience of acupuncture therapies, received any antiemetic medication or had nausea, vomiting or retching within 24 hours of surgery. Two patients withdrew from study.
Interventions	Group 1: ondansetron 4 mg IV given at induction of anaesthesia and sham electro-acupoint stimulation at P6 acupoints (30 to 60 min before induction and continued to the end of surgery). Group 2: electro-acupoint stimulation at P6 bilaterally (30 to 60 min before induction and continued to the end of surgery) and saline IV given at induction of anaesthesia. Group 3: sham electro-acupoint stimulation at P6 bilaterally (30 to 60 min before induction and continued to the end of surgery) and saline IV given at induction of anaesthesia.
Outcomes	Nausea (0–2h), vomiting (0–2h), risk of rescue antiemetic drug, adverse effects.
Notes	Rescue antiemetic was dexamethasone 8 mg IV when patient's nausea score > 5 out of 10 for 15 min or longer, 2 emetic episodes within 15 min, or at patient's request. No redness residue on acupoint site in any groups.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	"Randomization was achieved using a random number generator..".
Allocation concealment?	Yes	"…In a sealed envelope technique". "Study drugs were prepared by the pharmacists not directly involved in the study..". Comments: the authors appeared to take steps to minimize inadequate allocation concealment.
Incomplete outcome data addressed? All outcomes	Yes	Reasons for withdrawals were given. No missing data reported for the 75 patients analysed.
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "There was no difference in patient demographics among the groups (Table 1)".
Blinding of patients? All outcomes	Yes	"All patients were also told that the device produced an electrical current that they may or may not feel. The screen on the unit (measuring 4 × 2 cm) was covered with an opaque tape in all groups so that the clinicians and research personnel were unaware if the unit was on or off ".
Blinding of healthcare providers? All outcomes	Yes	"All patients were also told that the device produced an electrical current that they may or may not feel. The screen on the unit (measuring 4 × 2 cm) was covered with an opaque tape in all groups so that the clinicians and research personnel were unaware if the unit was on or off ".
Blinding of outcome assessor? All outcomes	Yes	"Postoperative data were collected by a separate research nurse not involved in the preoperative or intraoperative management of patients".

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), risk of rescue antiemetic (metoclopramide).
Notes	No treatment data were excluded from analysis. Also reported separate incidences of nausea and vomiting (0–1h) and (6–24h). No side effects identified in the trial.

Risk of bias

Item	Authors' judgement	Description

Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for 90 patients analysed.
Free of selective reporting?	Yes	All expected outcomes were reported.
Free of other bias?	Yes	Baseline characteristics were comparable. “The anthropometric data, the duration of surgery and the amount of postoperative analgesia were comparable between the three groups”.
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	No	The outcome assessor was not blinded.
Habib 2006		
Methods	Method of allocation concealment unclear. For blinding, the transcutaneous acupoint electrical stimulation was covered with opaque gauze that was taped to the wrist. Outcome assessor blinded.	
Participants	94 Women undergoing Caesarean delivery under spinal anaesthesia. Exclusion: previous experience of acupuncture or acu-stimulation, had experienced vomiting or retching within 24 h before surgery, had taken on antiemetic or a glucocorticoid within 24 h before surgery, or had an implanted pacemaker or defibrillator device. Three patients withdrew from study because of protocol violations.	
Interventions	Transcutaneous acupoint electrical stimulation device on P6 acupoint of the dominant hand 30 to 60 min before surgery. Patients asked to wear wristband for 24 h after surgery. Sham transcutaneous acupoint electrical stimulation device on dorsum of wrist of the dominant hand 30 to 60 min before surgery. Patients asked to wear wristband for 24 h after surgery.	
Outcomes	Postoperative nausea (0–24h), postoperative vomiting (0–24h), risk of rescue antiemetic.	
Notes	Intraoperative nausea and vomiting data reported in the paper. Rescue antiemetic was ondansetron 4 mg IV if nausea score was 6 or more, or at patient’s request.	
Risk of bias		
Item	**Authors’ judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficent information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	Reasons for withdrawals given. No missing data reported for 91 patients analysed.
Free of selective reporting?	No	Side effects not reported
Free of other bias?	Yes	Baseline characteristics were comparable. “The two groups were similar with respect to demographics, parity, history of PONV or motion sickness, smoking status, duration of surgery, blood loss, intraoperative fluids, intraoperative IV fentanyl, intraoperative IV ephedrine, treatment for pruritus, and consumption of oxycodone/acetaminophen tablets (Table 1)”.
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar. “For blinding, the ReliefBand was covered with opaque gauze that was taped to the wrist”.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Yes	“A separate researcher who was unaware of the patient’s randomisation collected that data…”.
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 of 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), risk of rescue antiemetic drugs.
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.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	"Randomization was conducted by computer..".
Allocation concealment?	Unclear	"…And the code was sealed until arrival of the patient in the operating theatre". Comment: not sure whether envelopes were sequentially numbered and opaque.
Incomplete outcome data addressed? All outcomes	No	In acupressure group (n=52), missing nausea and vomiting data in 8 and 5 patients respectively. In sham group (n=52), missing nausea and vomiting data in 13 and 5 patients respectively.
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "The groups were comparable in age, weight and duration of surgical procedure (Table 1)".
Blinding of patients? All outcomes	Yes	"Both patients and nurses were unaware of patient group allocation".
Blinding of healthcare providers? All outcomes	Yes	"Both patients and nurses were unaware of patient group allocation".
Blinding of outcome assessor? All outcomes	Yes	"..An anaesthetist blinded to the therapy registered whether nausea, retching or vomiting had occurred".

Harmon 2000

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.
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. Rescue antiemetic use reported as mean dose (no data for risk of rescue cyclizine use). Side effect of acupressure bands was "some localized discomfort in a small number of women".

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	Reasons for withdrawals were given. No missing data reported for 94 patients analysed.

Free of selective reporting?	No	Risk of rescue cyclizine not reported separately for nausea and vomiting outcomes.
Free of other bias?	Yes	Baseline characteristics were comparable. "The groups were comparable with respect to age, weight, height and bupivacaine dose (Table 1)".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Yes	"Bands were not visible to the assessing anaesthetist during operations, as patients' arms were covered with surgical drapes".
Blinding of outcome assessor? All outcomes	Yes	"After 6 and 24h, an anaesthetist blinded to the therapy noted whether nausea, retching or vomiting had occurred".

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. Groups 1 and 2 were combined for data analysis. Side effect of electro-acupuncture were sleepiness and feeling tired.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data was reported for the 100 patients analysed.
Free of selective reporting?	No	Only vomiting was reported. Authors should have assessed nausea in women and the risk of rescue antiemetic drugs.
Free of other bias?	Yes	Baseline characteristics were comparable. "The age, weight, and duration of anaesthesia did not differ significantly among the groups (Table 1)".
Blinding of patients? All outcomes	Unclear	Insufficient information.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Unclear	Insufficient information.

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 of 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), risk of rescue antiemetic drug, side effects of acupressure wristbands.	
Notes	Rescue antiemetic was metoclopramide. No side effects were noted.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	"Randomization was conducted by computer..".
Allocation concealment?	Unclear	"…With each code sealed in an envelope to be opened upon the parturient's arrival in the operating room". Comment: not sure if envelopes were sequentially numbered and opaque.
Incomplete outcome data addressed? All outcomes	Yes	"All parturients completed the trial and tolerated the bands well".
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "There were no statistically significant difference with respect to age, weight, height, duration of operation, intraoperative blood loss, duration of pain relief, total epidural morphine dosage, percentage of parturients requiring additional analgesics and total time spent wearing bands between the two groups".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Yes	"An independent anaesthesiologist blinded to the parturient groups followed up all parturients".
Klein 2004		
Methods	Patients randomized by computer-generated random number tables to either acupressure or sham groups. Both groups had acupressure bands covered by a soft cotton roll to ensure blinding. Anaesthetist caring for the patient was not aware of the group allocation. Outcome assessor blinded to treatment allocation.	
Participants	152 Patients undergoing coronary artery bypass graft or valvular surgery. Exclusion: past history of hiatus hernia, heartburn, or previous gastric surgery, morbid obesity, taking antiemetic medications, H2 receptor antagonist, or proton pump inhibitors. No details about withdrawals or loss to follow up.	
Interventions	Acupressure wristbands on P6 acupoint on both wrists before induction of anaesthesia, removed 24 h after extubation. Sham acupressure wristbands on P6 acupoint of both wrists before induction of anaesthesia, removed 24 h after extubation. Sham group had band without a bead placed on P6 acupoint.	
Outcomes	Nausea (0–24h), vomiting (0–24h), risk of rescue antiemetic drug, risk of adverse effects.	
Notes	Rescue antiemetic was dimenhydrinate 50 mg IV for patients who reported moderate or severe nausea, or who experienced retching or vomiting. No significant adverse effects reported in either group.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	"Patients were randomized by computer-generated random number tables to either acupressure or placebo control groups".
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for the 152 patients analysed.
Free of selective reporting?	Yes	Reported all expected outcomes.
Free of other bias?	Yes	Baseline characteristics were comparable. "There were no differences between the 2 groups with regard to demographic data and surgical characteristics (Table 1)".

Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Yes	"The anaesthesiologist caring for the patient was not aware of group allocation".
Blinding of outcome assessor? All outcomes	Yes	"All patients were assessed for nausea and vomiting by nursing staff in the intensive care unit, who were unaware of treatment allocation".

Lewis 1991	
Methods	Method of allocation concealment was not given. Outcome assessor was blinded. Acupressure wristbands were worn for approximately 4 hours.
Participants	66 Children undergoing strabismus correction surgery. Excluded: children with anatomical or neurological abnormalities of the upper limbs. Two children lost to follow up.
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), risk of rescue antiemetic drug, side effects.
Notes	Both types of wristbands were identical unless turned inside out. Rescue antiemetic was droperidol 0.02 mg/kg IV for vomiting. No side effects reported.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	Two patients in acupressure group had incomplete data. Comment: unlikely to have a clinically relevant impact on summary estimate.
Free of selective reporting?	No	Although nausea was an outcome collected in the methods section it was not reported in the results because nausea may be difficult to assess in children.
Free of other bias?	Yes	Baseline characteristics were comparable. "There were no significant differences between the two groups in their patient characteristics (Table 1)".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Yes	The anaesthetic staff were blinded.
Blinding of outcome assessor? All outcomes	Yes	"A second blinded investigator recorded all other perioperative data, including the incidence of postoperative nausea and vomiting in the recovery areas".

Liu 2008	
Methods	Method of allocation concealment not given. Anaesthetist and the outcome assessor were blinded.
Participants	96 Patients undergoing laparoscopic cholecystectomy who were aged 18 to 60 years. Exclusions: pregnancy, women experiencing menstrual symptoms, patients with permanent cardiac pace-maker, previous experience with acupuncture therapies before surgery, received antiemetics or experienced nausea, vomiting, or retching within 24 h of surgery. No patients withdrew from study.
Interventions	Group 1: transcutaneous electro-acupoint stimulation using a peripheral nerve stimulator at P6 (2–100 Hz, 50 ms, 0.5–4mA) applied 30 to 60 min before induction of anaesthesia, and continued to the end of surgery. Group 2: inactive device with similar electrode for transcutaneous electro-acupoint stimulation using a peripheral nerve stimulator at P6 applied 30 to 60 min before induction of anaesthesia, and continued to the end of surgery.
Outcomes	Nausea (0–24h), vomiting (0–24h), risk of rescue antiemetic drug (0–24h), adverse effects of transcutaneous electro-acupoint stimulation.

Notes	Rescue antiemetic drug was ondansetron 4 mg IV, to patients who had a nausea score of more than 5 on a 10 point scale, vomited twice within 15 min, or at the patient's request. P6 acupoint stimulation was associated with a reduction in the risk of severe nausea (Group 1: 2/48 versus Group 2: 14/48). No redness, swelling, itching, and pain, or other relevant complications at P6 acupoint in the two groups.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	"Patients were randomized into two groups of 48 in each using a table of random numbers".
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	"All 96 patients completed the study".
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "As shown in Table 1 and Table 2, the patients' gender, age, weight, ASA physical status, previous PONV history, duration of surgery or anaesthesia, transfusion amount, operative procedure and doses of opioids in the two groups were not significantly different".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Yes	"The anesthesiologists and care providers were blinded to the study group".
Blinding of outcome assessor? All outcomes	Yes	"Postoperative data were collected by a separate research nurse who was not aware of the preoperative or perioperative management of patients".

Misra 2005

Methods	Method of allocation concealment was not given. Subjects were randomly assigned to groups using computer-generated random number table. Patient, anaesthetist, and the outcome assessor were blinded.
Participants	123 Adults (18–52y) undergoing middle ear surgery. Exclusion: pregnancy, obesity, diabetes mellitus, impaired renal or liver functions; patients who had taken H2 antagonists, antiemetics, or psychoactive medication; or had nausea, retching, or vomiting within 48 h before surgery. Three patients withdrew because: they required administration of dexamethasone (n=2), and facial nerve injury (n=1).
Interventions	Group 1: sham plaster 1cm × 1cm patch affixed to P6 acupoint on both forearms 30 min before induction of anaesthesia and normal saline IV at the end of surgery. Plasters removed 6 h after surgery. Group 2: capsicum plaster containing capsicum oleoresin 1% w/w 1cm × 1cm patch affixed to P6 acupoint on both forearms 30 min before induction of anaesthesia and normal saline IV at the end of surgery. Plasters removed 6 h after surgery. Group 3: sham plaster 1cm × 1cm patch affixed to P6 acupoint on both forearms 30 min before induction of anaesthesia and ondansetron 4 mg IV at the end of surgery. Plasters removed 6 h after surgery.
Outcomes	Nausea (0–24h), vomiting (0–24h), risk of rescue antiemetic drug (0–24h), adverse effects of plaster.
Notes	Nausea (0–6h), vomiting (0–6h), incidence of rescue antiemetic (0–6h) also reported. Rescue antiemetic was ondansetron 4 mg IV for patients with persistent nausea for more than 5 min, two or more episodes of vomiting/retching, or at patient's request for PONV treatment. "One patient complained of mild irritation at the site of capsicum plaster application. No other adverse effects attributable to acu-stimulation or ondansetron were observed".

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	"The subjects were randomly assigned to one of the three groups using a computer-generated random number table".
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	Reasons for withdrawals given. No missing data reported for the 120 patients analysed.
Free of selective reporting?	Yes	All expected outcomes reported.

Free of other bias?	Yes	Baseline characteristics were comparable. "The demographic characteristics of the three groups were similar, as were history of previous PONV and motion sickness".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Yes	"Anesthesia was standardized and given by an anesthesiologist blinded to group assignment".
Blinding of outcome assessor? All outcomes	Yes	"The incidence of PONV was evaluated within six hours and 24 hr after transfer to the postoperative unit by a blinded observer".
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 disqualified after enrolment when propofol was administered during the anaesthetic.	
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), risk of rescue antiemetic drugs.	
Notes	Rescue antiemetics were ondansetron and droperidol IV. Sham electro-acupuncture and sham reference group data were combined.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	"A randomized block design procedure was used to assign enrollees to one of three groups..".
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	Reason for withdrawal of one patients was given. No missing data reported for 120 patients analysed.
Free of selective reporting?	Unclear	There was no description about side effects of therapy in the trial, but in the correspondence (Rusy 2002) the authors wrote "There were no noted muscle contractions or patients who complained of paresthesias during the study".
Free of other bias?	Yes	Baseline characteristics were comparable. "The groups were similar for age, sex, weight, analgesics administered, and surgical time (Table 1), with no differences found".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Yes	"Experienced recovery room nurses, who were blinded to the treatment group, assessed nausea and vomiting".
Blinding of outcome assessor? All outcomes	Yes	"Experienced recovery room nurses, who were blinded to the treatment group, assessed nausea and vomiting".
Samad 2003		
Methods	Patients randomly assigned by random table number. Blinded observer evaluated outcomes. Unclear whether patients were blinded as the wristband was not covered by gauze. Anaesthetist caring for the patient was most likely to be blinded as the intervention was given by investigators not involved with patient care.	
Participants	50 Male and female patients (18–60y) undergoing laparoscopic cholecystectomy. Exclusion: obesity (weight > 80 kg), diabetics, patients with history of postoperative nausea and vomiting, patients receiving antiemetics and histamine H2 antagonists.	

Interventions	Acupressure band on right hand at P6 acupoint half an hour before induction of anaesthesia, and kept on for 6 hours after surgery. Sham acupressure band on right hand with plastic bead placed on the dorsum of forearm.
Outcomes	Nausea (0–6h), vomiting (0–6h), risk of rescue antiemetic drug, side effects.
Notes	Rescue antiemetic was metoclopramide 10 mg IV for nausea or vomiting. No side effects or complications associated with either intervention.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	"Patients were randomly assigned by random table number to either group..".
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for 50 patients analysed.
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "There was no statistically significant difference with respect to age, sex, weight and duration of surgery between the two groups (Table 1)".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Yes	"A blinded observer in the recovery room (one of the investigator not involved in applying acupressure band) evaluated the patients for presence of nausea and vomiting…".

Schlager 1998

Methods	Method of allocation concealment not given. Risk 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 acupoint 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), risk of rescue antiemetic drug.
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.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for 40 children analysed.
Free of selective reporting?	Unclear	Risk of nausea was not recorded because it may be difficult to assess in children. Authors stated that "stimulation of P6 with a low-level laser has no known side effects".
Free of other bias?	Yes	Baseline characteristics were comparable. "There were no significant differences between the groups in age, sex distribution, ASA status, weight, height, duration of

		anaesthesia, duration of surgery or number of repaired muscles (Table 1)".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar. "Neither children nor parents were able to tell if the laser was active".
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Unclear	Insufficient information.
Schultz 2003		
Methods	Study envelopes with the group allocations were prepared by the principal investigator and the study pharmacist using a random number table. The envelopes were opened by the admitting nurse. Nurses were taught how to apply the acupressure bands by a member of the research team. Registered nurses documented outcomes.	
Participants	103 Women undergoing gynaecological surgery. Exclusions: pregnancy, surgery for cancer within the previous 5 years, chemotherapy or radiation therapy within 5 years, an antiemetic within 24 hours before surgery, previous use of acupressure bands, or peripheral neuropathy. 40 women withdrew before completion of trial due to non-administration of study drug and change in postoperative plans due to earlier hospital discharge.	
Interventions	Group 1: droperidol 1.25 mg IV at induction and acupressure wristband at P6 acupoint on both wrists before surgery (worn up to 48 hours after surgery). Group 2: droperidol 1.25 mg IV at induction and sham acupressure wristband at P6 acupoint on both wrists before surgery (worn up to 48 hours after surgery). Sham acupressure wristband had flat button which did not exert pressure on P6 acupoint. Group 3: normal saline IV at induction and acupressure wristband at P6 acupoint on both wrists before surgery (worn up to 48 hours after surgery). Group 4: normal saline IV at induction and sham acupressure wristband at P6 acupoint on both wrists before surgery (worn up to 48 hours after surgery).	
Outcomes	Nausea (0-duration of hospital stay), vomiting (0-hospital stay).	
Notes	Authors replied to our request for unpublished data for incidence of nausea and vomiting during hospital stay.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	Used random number table.
Allocation concealment?	Yes	"Study envelopes with the appropriate acupressure band and drug preparation were prepared by the principal investigator and the study pharmacist…. The packets were kept in a secure area of the surgical admitting department. The envelope, containing the study group designation, was opened by the admitting nurse…".
Incomplete outcome data addressed? All outcomes	No	Although 40 women withdrew from the study, reasons were given. "There was no statistically significant difference in the age of the 103 women who continued in the study as compared with 40 women who did not complete the study". Of the 103 women recruited, 95 and 62 women had complete data for nausea and vomiting during hospital stay respectively. Comment: missing data likely to bias the summary effect measure.
Free of selective reporting?	No	Risk of side-effects and use of rescue antiemetic drugs were not described in the paper.
Free of other bias?	Yes	Baseline characteristics appeared to be comparable. There was no difference among the groups for age, type of surgery, duration of surgery, duration of acupressure wristband use.
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.

Blinding of outcome assessor? All outcomes	Unclear	Insufficient information.
Sharma 2007		
Methods	Method of allocation concealment not given. No blinding.	
Participants	60 Women undergoing laparoscopic cholecystectomies under general anaesthesia. Exclusion: obesity, previous history of PONV and motion sickness.	
Interventions	Group 1: ondansetron 4 mg IV given 10 min after induction of anaesthesia. Group 2: bilateral P6 acupuncture 5 minutes before induction of anaesthesia. Intermittent stimulation was given at P6 acupoints by rotating needle clockwise and anticlockwise up to 30 min. Group 3: combination of group 1 and group 2 interventions.	
Outcomes	Nausea (0–7h), vomiting (0–7h), risk of rescue antiemetic drug (0–7h), risk of adverse effects.	
Notes	Rescue antiemetic was metoclopramide 10 mg IV. Data in group 3 was not used in any of the meta-analyses. No pain, bleeding, vasovagal attack, or broken acupuncture needles noted in any of the groups.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for 60 women analysed.
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "There was no significant difference among the patients in both the groups regarding weight, age, height, gender, hours of preoperative fasting and duration of anesthesia and surgery…".
Blinding of patients? All outcomes	No	"Blinding of any form was not possible because acupuncture needles had to be kept in situ in the operating room".
Blinding of healthcare providers? All outcomes	No	"Blinding of any form was not possible because acupuncture needles had to be kept in situ in the operating room".
Blinding of outcome assessor? All outcomes	No	"Blinding of any form was not possible because acupuncture needles had to be kept in situ in the operating room".
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 apnoea.	
Interventions	Group 1: acupressure wristband on P6 acupoints of 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), risk of rescue antiemetic drug, 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.	
Risk of bias		

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for 100 patients analysed.
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "There were no differences between the groups with regard to demographics or previous retching, vomiting, or either (table 2)".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Yes	"Postanesthesia care unit and ward nurses who assessed and charted postoperative emesis and medication administration were blinded to the group assignment of each patient".
Blinding of outcome assessor? All outcomes	Yes	"Postanesthesia care unit and ward nurses who assessed and charted postoperative emesis and medication administration were blinded to the group assignment of each patient".

Streitberger 2004	
Methods	Acupuncturist obtained randomization allocation by phone from a member of the university clinical trials centre, who had no contact with study patients. Authors wrote "an adequate allocation concealment was thereby assured". Patients, outcome assessor, nurses, anaesthetists, and all other staff members were not informed about the allocation. Blinding of the patients was ensured by using a placebo needle that simulated an acupuncture procedure without penetrating the skin. Intention-to-treat analysis was used.
Participants	212 Females undergoing gynaecological or breast surgery under general anaesthesia. Exclusion: acupuncture treatment during the last 6 months, pregnancy, nausea or vomiting during the past 24 h, lymphoedema of the upper limbs, eczematous skin changes at the P6 acupoint, and coagulopathy. One patient in the acupuncture group withdrew consent and was treated as a failure in the analysis.
Interventions	Acupuncture group: 52 patients had acupuncture to P6 acupoint on both wrists, 20 min before induction of anaesthesia; another 54 patients had acupuncture to P6 acupoint on both wrists immediately after induction of anaesthesia. Sham acupuncture: 51 patients had placebo acupuncture to P6 acupoint on both wrists, 20 min before induction of anaesthesia; another 55 patients had placebo acupuncture to P6 acupoint on both wrists immediately after induction of anaesthesia.
Outcomes	Nausea (0–24h), vomiting (0–24h), risk of rescue antiemetic drugs, adverse events related to acupuncture.
Notes	Dimenhydinate and dolasetron rescue antiemetics used. Haematomas reported by one patient in the acupuncture group and by two patients in the placebo acupuncture group. Allergy to sticky plaster reported by 5 patients in each group. No severe adverse reaction reported.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	"The patients were randomly distributed by type of surgery (gynaecological or breast) to ensure balance between groups". Comment: no further details provided in the paper.
Allocation concealment?	Yes	"The acupuncturist obtained randomisation allocation by phone from a member of the Coordination Centre for Clinical Trials, University of Heidelberg, who had no contact with study patients. An adequate concealment was thereby assured".
Incomplete outcome data addressed? All outcomes	Yes	Reasons for withdrawals given. Intention-to-treat analysis used.
Free of selective reporting?	Yes	All expected outcomes reported.

Free of other bias?	Yes	Baseline characteristics were comparable. ”Baseline characteristics revealed no relevant differences between the two groups (Table 1)“.
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar. To assess blinding, patients were asked what kind of needle they believe they had received”.
Blinding of healthcare providers? All outcomes	Yes	“The patients, the observer of the endpoints, the nurses, the anaesthetists and all other staff members were not informed about the allocation”.
Blinding of outcome assessor? All outcomes	Yes	“The patients, the observer of the endpoints, the nurses, the anaesthetists and all other staff members were not informed about the allocation”.
Tavlan 1996		
Methods	Method of allocation concealment not given. No details about blinding. This study was reported as an abstract.	
Participants	65 Women (18–45 years) undergoing gynaecological laparoscopy.	
Interventions	Group 1: ondansetron 8 mg IV before induction. Group 2: 0.2 ml 50% dextrose on the P6 acupoint before induction. Group 3: 20 ml IV saline before induction.	
Outcomes	Nausea (0–1h), vomiting (0–1h).	
Notes	Group 3 (n=20) not used in the acupoint P6 stimulation versus sham analyses.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for 65 patients analysed.
Free of selective reporting?	Unclear	Risk of side effects and rescue antiemetic drugs not given because the article was an abstract.
Free of other bias?	Yes	Baseline characteristics were comparable. “No significant differences were observed between the groups in terms of demography”.
Blinding of patients? All outcomes	Unclear	Insufficient information.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Unclear	Insufficient information.
Turgut 2007		
Methods	Authors stated that patients were randomized using closed envelopes into one of two groups. In both groups, wristbands were covered by loose gauze to ensure observer-blinding. Anaesthesiologists caring for the patients were not aware of group assignment. Outcome assessor appears to be blinded to treatment allocation.	
Participants	102 Women aged 40 to 65 years, with no previous experience of acupressure bands, undergoing elective gynaecological surgery (total abdominal hysterectomy and bilateral salpingo-oophorectomy). One patient in acupressure group and one in sham group withdrew because of swelling and erythema in treated hand and protocol violation respectively. Exclusion criteria: obesity (body mass index > 30), diabetes, history of motion sickness, postoperative nausea and vomiting, or smoking.	
Interventions	Acupressure group: wristband with plastic bead positioned at P6 point on both wrists, 30 minutes before induction of general anaesthesia. Wristbands left on for 24 hours. Sham group: wristband with plastic bead positioned at non-acupoint site on the dorsal surface of both forearm, 30 minutes before induction of general anaesthesia. Wristbands left on for 24 hours. Both groups were educated on the use of patient controlled analgesia before surgery. Patients received patient controlled analgesia containing morphine in the postanaesthetic care room, and continued for 24 hours.	

Outcomes	Nausea (0–24 h), vomiting (0– 24 h), rescue antiemetic drug use, adverse effects of wristbands.
Notes	Risks of nausea and vomiting on arrival in recovery room reported. No adverse effects or complications were observed due to acupressure wristbands, except for one patient in the acupressure group who withdrew due to swelling and erythema of the treated hand. Rescue antiemetic was metoclopramide 10 mg IV.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	Reasons for withdrawal given. No missing data reported for 100 patients analysed.
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	"Patients of both groups were comparable with regard to age, weight, height, ASA physical status and duration of surgery (Table 1)".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar.
Blinding of healthcare providers? All outcomes	Yes	"The anaesthesiologists caring for the patients were not aware of group assignment".
Blinding of outcome assessor? All outcomes	Yes	"The study was observer-blinded".

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), risk of rescue antiemetic drug.
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. Late outcomes (discharge to first day after surgery) also reported. No data on outcomes (0–24h) according to author.

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Yes	Yoking randomization (based on computer-generated list) was used to equal distribution of variables that are known to affect the outcome.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	Details about withdrawals were given. No missing data reported for 187 children analysed.
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "There were no differences among the various study groups in

		regard to baseline demographic characteristics such as age and history of PONV (Table 1)".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar. "Children, parents, surgeons, anesthesiologists, PACU nursing staff, and the research assistant, were all blinded to group assignment".
Blinding of healthcare providers? All outcomes	Yes	"Children, parents, surgeons, anesthesiologists, PACU nursing staff, and the research assistant, were all blinded to group assignment".
Blinding of outcome assessor? All outcomes	Yes	"Children, parents, surgeons, anesthesiologists, PACU nursing staff, and the research assistant, were all blinded to group assignment".
White 2002		
Methods	Randomization by computer-generated random number table. All patients were told that the ReliefBand acu-stimulation 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 acu-stimulation 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.	
Interventions	Group 1: ondansetron 4 mg and inactive acu-stimulation device at P6 acupoint on arrival in the recovery room. Device worn for 72 hours after surgery. Group 2: saline 2 mL and active acu-stimulation device at P6 acupoint on arrival in the recovery room. Device worn for 72 hours after surgery. Group 3: ondansetron 4 mg and active acu-stimulation 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), risk of rescue antiemetic drug, 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 were not used for data analysis. No swelling at wrist or erythema reported. No outcome measures (0–72h) given in the paper.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	"Patients were randomly assigned to one of three treatment groups using a computer-generated random number table…".
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data reported for 120 patients randomized.
Free of selective reporting?	Yes	All expected outcomes were reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "The three treatment groups were comparable with respect to demographic characteristics, pre-existing risk factors for development of PONV, and preoperative nausea scores (Table 1)".
Blinding of patients? All outcomes	Yes	All patients were told that the ReliefBand acu-stimulation device produces a sensation which they may or may not feel to minimize bias. Patients recorded outcome measures in a patient diary.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Yes	All patients were told that the ReliefBand acu-stimulation device produces a sensation which they may or may not feel to minimize bias. Patients recorded outcome measures in a patient diary.
Yang 1993		

Methods	Method of allocation concealment not given. Recovery room nurses collected data. No antiemetic drugs were given in the recovery room.
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.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	No missing data recorded for 120 patients analysed.
Free of selective reporting?	No	Nausea was not reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "There was no statistically significant differences in age, weight, duration of anesthesia or amount of fluid given among the three groups of patients (Table 1)".
Blinding of patients? All outcomes	Unclear	Insufficient information.
Blinding of healthcare providers? All outcomes	Unclear	Insufficient information.
Blinding of outcome assessor? All outcomes	Unclear	Insufficient information.

Yentis 1992

Methods	Method of allocation concealment not given. Medical staff, children and parents were blinded to treatment groups. No specific details about who collected the outcomes and whether or not they were blinded to treatment allocation.
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), risk of rescue antiemetic drug, side effects of treatment.
Notes	Rescue antiemetic was dimenhydrinate IM. Restlessness more frequent in droperidol group than acupuncture group. Risk of vomiting before discharge from hospital also reported in paper. Group 3 data was not used in the data analysis.

Risk of bias

Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Unclear	Insufficient information.
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	One patient in each group lost to follow up. Comment: unlikely to bias summary estimate.
Free of selective reporting?	Unclear	Nausea was not reported because it may have been difficult to assess in younger children.
Free of other bias?	Yes	Baseline characteristics were comparable. "Age, weight, number of muscles repaired and duration of anaesthesia did not differ among the groups (Table)".

Blinding of patients? All outcomes	Yes	"Whether or not patients received droperidol, both treatments or acupuncture alone, was unknown to the staff, the patients and their parents".
Blinding of healthcare providers? All outcomes	Yes	"Whether or not patients received droperidol, both treatments or acupuncture alone, was unknown to the staff, the patients and their parents".
Blinding of outcome assessor? All outcomes	Unclear	Insufficient information.
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 unaware 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.	
Interventions	Group 1: ReliefBand (watch-like acu-stimulation 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 acu-stimulation positioned at P6 acupoint before end of surgery, worn up to 9 hours after surgery. Group 3: ReliefBand with no acu-stimulation 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), risk 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 the sham control group for data analysis. Although the ReliefBand devices were identical in appearance, their 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 (requested data from authors but no reply). Side effects of wristbands were mild cutaneous irritation with erythema.	
Risk of bias		
Item	**Authors' judgement**	**Description**
Adequate sequence generation?	Yes	"Outpatients who had been fasted overnight were randomly assigned to one of three treatment groups (groups T, S, and P) with a computer-generated random number table".
Allocation concealment?	Unclear	Insufficient information.
Incomplete outcome data addressed? All outcomes	Yes	Reasons for withdrawals were given. No missing data recorded for 221 patients analysed.
Free of selective reporting?	Yes	All expected outcomes reported.
Free of other bias?	Yes	Baseline characteristics were comparable. "The three treatment groups were comparable demographically and with respect to their histories of PONV and motion sickness, baseline nausea score, duration of surgery, and the time the acu-stimulation device was applied before the end of surgery (Table 1)".
Blinding of patients? All outcomes	Yes	Authors took adequate steps to make interventions appear similar. "To minimize bias resulting from the presence or absence of the electrical stimulation, all patients were told before the operation that the ReliefBand produces a sensation which 'they might or might not feel".
Blinding of healthcare providers? All outcomes	Yes	"The recovery room nursing staff were unaware of the acu-stimulation treatment group to which the patient had been assigned".
Blinding of outcome assessor? All outcomes	Yes	"The recovery room nursing staff were unaware of the acu-stimulation treatment group to which the patient had been assigned".

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Agarwal 2005	P6 acupoint stimulation not used. Authors used Korean hand acupressure point K-D2 in the study.
Al-Sadi 1997	No sham treatment group used. Control was defined as no intraoperative acupuncture needle at P6 acupoint.
Alkaissi 2005	Patients did not undergo surgery.
Cekmen 2007	P6 acupoint stimulation not used. Authors used transcutaneous electrical nerve stimulation on neck and mastoid area.
Chen 2005	Not randomized controlled trial. First 52 subjects were in the control group (no treatment) and remaining 52 patients were in the acupressure group.
Coloma 2002	Treatment of established postoperative nausea and vomiting.
Dundee 1988	Risk 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	Risk 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.
Ho 2006	Prevention of intraoperative nausea and vomiting.
Kabalak 2005	Both P6 and CV 13 acupoints used. No treatment was given to the control group.
Khan 2004	Risks of nausea and vomiting were not reported separately.
Kim 2002	Control was defined as an inactive capsicum plaster tape fixed at the Korean hand acupuncture point K-D2 point of both hands.
McMillan 1994	All transcutaneous electrical stimulation at P6 acupoint groups received antiemetics. Risk 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.
Schneider 2005	Same study as Streitberger et al (2004). Incidence of postoperative nausea and vomiting were not reported separately.
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.
White 2005	This study compared three prophylactic acu-stimulation treatments: preoperative, postoperative, and both preoperative and postoperative. No sham treatment group used for both preoperative and postoperative acu-stimulation.
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 risk of vomiting. Risk 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 drug group for comparison.