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Stimulation of the wrist acupuncture point PC6 for preventing postoperative nausea and vomiting

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Abstract

Background—Postoperative nausea and vomiting (PONV) are common complications following surgery and anaesthesia. Antiemetic drugs are only partially effective in preventing PONV. An alternative approach is to stimulate the PC6 acupoint on the wrist. This is an update of a Cochrane review first published in 2004, updated in 2009 and now in 2015.

Objectives—To determine the effectiveness and safety of PC6 acupoint stimulation with or without antiemetic drug versus sham or antiemetic drug for the prevention of PONV in people undergoing surgery.

Search methods—We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (Cochrane Library, Issue 12, 2014), MEDLINE (January 2008 to December 2014), EMBASE (January 2008 to December 2014), ISI Web of Science (January 2008 to December 2014), World Health Organization Clinical Trials Registry, ClinicalTrials.gov, and reference lists of articles to identify additional studies. We applied no language restrictions.

Selection criteria—All randomized trials of techniques that stimulated the PC6 acupoint compared with sham treatment or drug therapy, or combined PC6 acupoint and drug therapy compared to drug therapy, for the prevention of PONV. Interventions used in these trials included acupuncture, electro-acupuncture, transcutaneous electrical acupoint stimulation, transcutaneous nerve stimulation, laser stimulation, capsicum plaster, acu-stimulation device, and acupressure in people undergoing surgery. Primary outcomes were the incidences of nausea and vomiting after surgery. Secondary outcomes were the need for rescue antiemetic therapy and adverse effects.

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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 this updated review, and incorporated comments from Cochrane peer reviewers into the final version. Simon Chan and Lawrence Fan provided comments on data extraction forms, extracted the data, and commented on all drafts of this updated review.

DECLARATIONS OF INTEREST

Anna Lee has no conflicts relating to this review.
Simon KC Chan has no conflicts relating to this review.
Lawrence TY Fan has no conflicts relating to this review.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

This updated review includes a comparison between a multimodal PC6 acupoint stimulation and an antiemetic drug prophylactic therapy versus antiemetic drug, and trial sequential analyses for PONV.

Data collection and analysis—Two review authors independently extracted the data and assessed the risk of bias domains for each trial. We used a random-effects model and reported risk ratio (RR) with associated 95% confidence interval (95% CI). We used trial sequential analyses to help provide information on when we had reached firm evidence in cumulative meta-analyses of the primary outcomes, based on a 30% risk ratio reduction in PONV.

Main results—We included 59 trials involving 7667 participants. We rated two trials at low risk of bias in all domains (selection, attrition, reporting, blinding and other). We rated 25 trials at high risk in one or more risk-of-bias domains. Compared with sham treatment, PC6 acupoint stimulation significantly reduced the incidence of nausea (RR 0.68, 95% CI 0.60 to 0.77; 40 trials, 4742 participants), vomiting (RR 0.60, 95% CI 0.51 to 0.71; 45 trials, 5147 participants) and the need for rescue antiemetics (RR 0.64, 95% CI 0.55 to 0.73; 39 trials, 4622 participants). As heterogeneity among trials was substantial and there were study limitations, we rated the quality of evidence as low. Using trial sequential analysis, the required information size and boundary for benefit were reached for both primary outcomes.

PC6 acupoint stimulation was compared with six different types of antiemetic drugs (metoclopramide, cyclizine, prochlorperazine, droperidol. ondansetron and dexamethasone). There was no difference between PC6 acupoint stimulation and antiemetic drugs in the incidence of nausea (RR 0.91, 95% CI 0.75 to 1.10; 14 trials, 1332 participants), vomiting (RR 0.93, 95% CI 0.74 to 1.17; 19 trials, 1708 participants), or the need for rescue antiemetics (RR 0.87, 95% CI 0.65 to 1.16; 9 trials, 895 participants). We rated the quality of evidence as moderate, due to the study limitations. Using trial sequential analyses, the futility boundary was crossed before the required information size was surpassed for both primary outcomes.

Compared to antiemetic drugs, the combination of PC6 acupoint stimulation and antiemetic therapy reduced the incidence of vomiting (RR 0.56, 95% CI 0.35 to 0.91; 9 trials, 687 participants) but not nausea (RR 0.79, 95% CI 0.55 to 1.13; 8 trials, 642 participants). We rated the quality of evidence as very low, due to substantial heterogeneity among trials, study limitations and imprecision. Using trial sequential analysis, none of the boundaries for benefit, harm or futility were crossed for PONV. The need for rescue antiemetic was lower in the combination PC6 acupoint stimulation and antiemetic group than the antiemetic group (RR 0.61, 95% CI 0.44 to 0.86; 5 trials, 419 participants).

The side effects associated with PC6 acupoint stimulation were minor, transient and self-limiting (e.g. skin irritation, blistering, redness and pain) in 14 trials. Publication bias was not apparent in the contour-enhanced funnel plots.

Authors' conclusions—There is low-quality evidence supporting the use of PC6 acupoint stimulation over sham. Compared to the last update in 2009, no further sham comparison trials are needed. We found that there is moderate-quality evidence showing no difference between PC6 acupoint stimulation and antiemetic drugs to prevent PONV. Further PC6 acupoint stimulation versus antiemetic trials are futile in showing a significant difference, which is a new finding in this update. There is inconclusive evidence supporting the use of a combined strategy of PC6 acupoint stimulation and antiemetic drug over drug prophylaxis, and further high-quality trials are needed.

INDEX TERMS

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

Wrist PC6 acupuncture point stimulation to prevent nausea and vomiting after surgery

Review question—Does a review of the evidence support the use of wrist PC6 acupuncture point stimulation (PC6 acupoint) as effective in reducing nausea and vomiting after surgery (PONV), compared to sham (dummy acupoint stimulation) or antiemetics (drugs that relieve nausea and vomiting) in people undergoing surgery? This review updates the evidence published in 2009, and is current to December 2014.

Background—Nausea and vomiting are two of the most common complications (up to 80%) after anaesthesia and surgery. Antiemetics are only partially effective and may cause adverse effects, like sedation and headache. Stimulating a PC6 acupoint, an alternative method, has been reported to reduce PONV with few serious side effects.

Study characteristics—We found 59 relevant studies, conducted between 1986 and 2015, involving 7667 participants undergoing elective surgery. Seven of the trials were conducted in 727 children. The PC6 acupoint stimulation varied from invasive techniques, such as traditional acupuncture needles, to noninvasive techniques, such as acupressure wristbands. PC6 acupoint stimulation was compared with six different types of antiemetic drugs (metoclopramide, cyclizine, prochlorperazine, droperidol. ondansetron and dexamethasone).

Key findings and quality of evidence

Effects of PC6 acupoint stimulation versus sham on PONV: We found a moderate-size effect in children and adults, although there were concerns about study limitations and unexplained variation in the effects. Further studies with sham comparisons are not necessary to confirm this beneficial effect.

Effects of PC6 acupoint stimulation versus antiemetic on PONV: We found no difference in the incidence of PONV. We rated the quality of this evidence as moderate, due to study limitations. Further studies are unlikely to show a difference.

Effects of combining PC6 acupoint stimulation and antiemetic versus antiemetic on PONV: We found a moderate-size effect on postoperative vomiting but not on postoperative nausea. However, there were concerns about study limitations, unexplained variation in effects between studies, and an insufficient number of studies. Further high-quality research

on combinations of PC6 acupoint stimulation and antiemetics are needed to reduce uncertainties about this effect on PONV.

Overall, the side effects related to PC6 acupoint stimulation were minor, transient and self-limiting (e.g. skin irritation, blistering, redness and pain) in 14 studies.

Conclusion—To prevent PONV, the effect of PC6 acupoint stimulation is comparable to antiemetics.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON [Explanation]

Acupoint PC6 stimulation versus sham for preventing postoperative nausea and vomiting

Patient or population: People at risk of postoperative nausea and vomiting
Settings: Surgery
Intervention: Acupoint PC6 stimulation
Comparison: 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				
	Sham	Acupoint PC6 stimulation				
Nausea - All trials	**Low**		**RR 0.68** (0.60 to 0.77)	4742 (40 studies)	⊕⊕◯◯ **low**[1,2]	
	200 per 1000	**136 per 1000** (120 to 154)				
	Moderate					
	400 per 1000	**272 per 1000** (240 to 308)				
	High					
	600 per 1000	**408 per 1000** (360 to 462)				
Vomiting - All trials	**Low**		**RR 0.60** (0.51 to 0.71)	5147 (45 studies)	⊕⊕◯◯ **low**[2,3]	
	200 per 1000	**120 per 1000** (102 to 142)				
	Moderate					
	400 per 1000	**240 per 1000** (204 to 284)				
	High					
	600 per 1000	**360 per 1000** (306 to 426)				
Rescue antiemetics	**329 per 1000**	**210 per 1000** (181 to 240)	**RR 0.64** (0.55 to 0.73)	4622 (39 studies)	⊕⊕◯◯ **low**[4,5]	
Adverse effects	Not estimable	Not estimable	Not estimable	35 studies[6]	Not applicable	See footnote[6]

* The basis for the **assumed risks** for nausea and vomiting is from a consensus panel (Gan 2014) using Apfel's simplified risk score (Apfel 1999). The assumed risk for rescue antiemetic is the median sham group risk across studies. 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 evidence
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] Of the 40 trials, 13 had one or more high risk of bias domains (downgrade 1 point due to study limitations).

[2] Substantial amount of heterogeneity (downgrade 1 point due to inconsistency).

[3] Of the 45 trials, 16 had one or more high risk of bias domains (downgrade 1 point due to study limitations).

[4] Moderate amount of heterogeneity (downgrade 1 point due to inconsistency).

[5] Of the 39 trials, 13 had one or more high risk of bias domains (downgrade 1 point due to study limitations).

[6] Twenty-two trials reported no adverse side effects. Minor, self-limiting and transient adverse effects reported in 13 studies (haematoma, redness, irritation and pain at acupuncture site; redness, swelling, discomfort, blistering at acupoint site when wearing acupressure wristband).

BACKGROUND

Description of the condition

Postoperative nausea and vomiting (PONV) are common complaints after general, regional, or local anaesthesia (Watcha 1992), with incidences up to 80% (Sadhasivam 1999). PONV may lead to delayed recovery from anaesthesia and surgery, unanticipated readmission to hospital and increased overall healthcare costs (Gan 2014).

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 risk ratios (RRs) 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, 95% confidence interval (CI) 1.16 to 1.51) and headache was more common after ondansetron (RR 1.16, 95% CI 1.03 to 1.30) (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 with non-pharmacological approaches (Gan 2014).

Description of the intervention

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), electro-acupoint stimulation, acupressure, and capsicum plaster. Most non-pharmacological studies have focused on stimulation of the wrist at the ‘Pericardium (PC6) acupuncture point’ to reduce nausea and vomiting. The PC6 acupoint lies between the tendons of the palmaris longus and flexor carpi radialis muscles, 4 cm proximal to the wrist crease (Yang 1993).

How the intervention might work

The mechanism by which PC6 acupoint stimulation prevents PONV has not been established in 'Western' evidence-based methodology. However, according to Traditional Chinese Medicine theory, surgery interrupts the balanced state of the human body by disturbing the movement of both *qi* (energy flow) and blood, leading to stomach *qi* going upward to cause nausea and vomiting (Lv 2013). By regulating the function of the stomach to reduce the adverse flow of *qi*, PC6 acupoint stimulation may prevent nausea and vomiting (Lv 2013). Other acupoints believed to prevent PONV include Shenmen (H7) (Ming 2002) and Shang Wen (CV13) (Somri 2001).

Why it is important to do this review

Despite supportive literature for the use of PC6 acupoint stimulation in recent consensus guidelines for the management of PONV (Gan 2014), there is currently a lack of widespread uptake of the technique. This may be due to a lack of evidence on the optimal timing, duration and method of PC6 acupoint stimulation (Streitberger 2011), and preference of anaesthesiologists for an immediate pharmacokinetic effect of an antiemetic over a slower onset of PC6 acupoint stimulation effect.

One of the earliest 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 PC6 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 PC6 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 PC6 acupoint stimulation.

In the last Cochrane review update (Lee 2009) of 40 trials (n = 4858), we showed that there were significant reductions in the incidences of 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 0.83) in the PC6 acupoint stimulation group compared with the sham treatment group. Compared to antiemetic drugs, the incidence 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) were similar in the PC6 acupoint stimulation group. Publication bias may have affected the risk ratio estimated for postoperative nausea but not for vomiting (Lee 2006) in the first version of the review published in 2004 (Lee 2004). However, in the next version (Lee 2009), publication bias was not apparent from the contour-enhanced funnel plots.

The rationale for conducting this Cochrane review update was to establish if there is firm evidence for the effect of PC6 acupoint stimulation in reducing the incidence of PONV using trial sequential analysis methodology. We were concerned that repeated updates (Lee 2004; Lee 2009) may introduce spuriously significant results (type 1 error) due to repeated significance testing.

OBJECTIVES

To determine the effectiveness and safety of PC6 acupoint stimulation with or without antiemetic drug versus sham or antiemetic drug for the prevention of PONV in people undergoing surgery.

METHODS

Criteria for considering studies for this review

Types of studies—We included all randomized controlled trials (RCTs) of techniques intended to stimulate the PC6 acupoint, compared with either sham treatment or antiemetic drugs, for the prevention of PONV. We defined 'sham treatment' as a device applied in a non-PC6 location, or any attempt to imitate (give the illusion of) PC6 acupoint stimulation. Therefore, for trials that assessed acupressure wristbands, we considered wristbands without studs placed at the PC6 acupoint as adequate sham treatment, and we included these trials in the review.

We excluded studies that only reported the severity of postoperative nausea or vomiting or both, and had not reported the incidence of postoperative nausea and vomiting or the need for rescue antiemetic.

Types of participants—We included all surgical patients without age limitation in the review. The age limits for children were defined by each study. We considered all types of surgery.

Types of interventions—Techniques intended to stimulate the PC6 acupoint: acupuncture, electro-acupuncture, laser acupuncture, transcutaneous electrical stimulation, conventional peripheral nerve stimulation, acu-stimulation device, acupressure, and capsicum plaster; versus sham treatment or drug therapy for the prevention of PONV. We grouped these diverse techniques 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 PC6 acupoint stimulation or when it was applied.

Types of outcome measures—We performed 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. Incidence of postoperative nausea.

2. Incidence of postoperative vomiting, defined as either retching or vomiting, or both.

We did not combine postoperative nausea and vomiting as we could not be certain that participants who vomited were also nauseated. If the authors reported several incidences of the outcome measure (for example 0 to six hours, six to 24 hours, 0 to 24 hours), we used the longest cumulative follow-up data from the end of surgery (in this case, 0 to 24 hours).

Secondary outcomes

1. Need for rescue antiemetic drug when prophylaxis failed.
2. Adverse effects from PC6 acupoint stimulation or antiemetic drug, or both.

Search methods for identification of studies

Electronic searches—We searched the following for relevant trials on 31st December 2014:

- The Cochrane Central Register of Controlled Trials (CENTRAL; Issue 12, 2014), in Appendix 1.
- Electronic databases: OVID MEDLINE (January 2008 to December 2014), in Appendix 2; OVID EMBASE (January 2008 to December 2014), in Appendix 3; ISI Web of Science (January 2008 to December 2014), in Appendix 4)
- World Health Organization Clinical Trials Registry and ClinicalTrial.gov
- 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 PC6 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). Searching unpublished trials may not be worthwhile, as many unpublished trials are of poor or unclear methodological quality (Van Driel 2009).

Data collection and analysis

Selection of studies—We screened titles and abstracts of publications identified from the search, and selected trials that fulfilled our inclusion criteria. There was one disagreement between review authors for inclusion into this systematic review. The third review author adjudicated and decided that the study (Zhu 2010) met the inclusion criteria. We examined all selected trials for duplicate data; where we found duplication, we used the results of the main trial report.

Data extraction and management—We extracted data independently, using a standardized data collection form, and resolved any discrepancies in data extraction by discussion. We collected data on the type, duration, and timing of PC6 acupoint stimulation, as well as the type and dose of prophylactic antiemetic drug. We recorded general details of the participant population and type of surgery. We collected outcome measures as described above for each study group. We did not consider factors such as the severity of PONV or the number of episodes of vomiting. In studies with more than two groups, we avoided double-counting of participants by following the guidelines for analysis in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011).

Assessment of risk of bias in included studies—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 2011). We graded each domain as low risk of bias, unclear (uncertain risk of bias) or high risk of bias, according to the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). For summary assessment of the risk of bias within and across studies, we followed the approach outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011) and rated it as low, unclear or high risk of bias.

We used the GRADE approach to describe the overall quality of the outcome, rating it as high, moderate, low or very low (Guyatt 2011). To make this assessment, we examined the study limitations (risk of bias), indirectness of evidence, serious inconsistency, imprecision of effect estimates and potential publication bias (Guyatt 2011). We downgraded the quality of evidence from high if there were deficiencies in these domains.

We included the following outcomes in Summary of findings for the main comparison, Summary of findings 2 and Summary of findings 3: incidence of postoperative nausea, incidence of postoperative vomiting, need for rescue antiemetic, and adverse effects.

Measures of treatment effect—For dichotomous data, we reported the risk ratio (RR) and the associated 95% confidence interval (95% CI).

Unit of analysis issues—None.

Dealing with missing data—We analysed data according to the intention-to-treat principle.

Assessment of heterogeneity—We measured heterogeneity using the I^2 statistic, a measure of the proportion of total variation in the estimates of treatment effect that is due to heterogeneity between studies rather than due to chance. We described the level of heterogeneity as not important (I^2 statistic from 0% to 40%), moderate (I^2 statistic from 30% to 60%), substantial (I^2 statistic from 50% to 90%) and considerable (I^2 statistic from 75% to 100%) (Higgins 2011).

Assessment of reporting biases—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 14). Contour-enhanced funnel plots display the area of statistical significance on a funnel plot to improve the correct identification of the presence or absence of publication bias. We used this in conjunction with the 'trim and fill' method (Duval 2000) to inform the likely location of missing studies, using STATA statistical software, as suggested by 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 non-significant studies would be plotted (Peters 2008).

Data synthesis—We used Review Manager 5 to perform the DerSimonian and Laird random-effects model meta-analyses of risk ratios, 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 estimated the number needed to treat for an additional beneficial outcome (NNTB) for different baseline risks for nausea and vomiting, using the RR (Smeeth 1999) to assess whether PC6 acupoint stimulation is worthwhile for individuals. We estimated the 95% CI around the NNTB using the method outlined by Altman 1998.

We undertook trial sequential analysis (TSA) to estimate the required information size in meta-analysis, that is, the number of participants needed to provide a reliable and conclusive estimate (Afshari 2015). The required information size was based on a risk ratio reduction of 30% (Apfel 2007), an overall type 1 error of 5%, power at 80%, incidence in the control arm and a model-based heterogeneity correction, using Trial Sequential Analysis software (Thorlund 2011).

Subgroup analysis and investigation of heterogeneity—We undertook exploratory a priori subgroup analyses, which included trials in adults versus children, and trials according to type of PC6 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 2003.

Sensitivity analysis—We conducted sensitivity analyses to estimate the robustness of results according to the risk of bias (low, unclear, high) and to the control event rate (≤ 20%, > 20%).

RESULTS

Description of studies

Results of the search—The search identified 43 studies for full-text review. Sixty-seven trials (40 included and 27 excluded) from our previous Cochrane review (Lee 2009) were brought forward for this systematic review. 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 59

included studies for meta-analysis. Ongoing trials are described in Characteristics of ongoing studies.

Included studies—We include 59 trials conducted between 1986 and 2015, involving 7667 participants (see Characteristics of included studies). The median sample size of trials was 104 (interquartile range: 75 to 156). All trials but three (Gieron 1993; Kim 2004; Zhu 2010) 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). Three trials recruited both children and adults (Amir 2007; Ebrahim Soltani 2010; Ravi 2010). Most participants had general anaesthesia. Women having elective Caesarean delivery received spinal anaesthesia in six studies (Direkvand-Moghadam 2013; Duggal 1998; El-Deeb 2011; Habib 2006; Harmon 2000; Ho 1996).

There were 10 types of PC6 acupoint stimulation: needle acupuncture (Dundee 1986; Dundee 1989; Sharma 2007; Streitberger 2004; Yentis 1992); infiltration of dextrose (Ravi 2010; Tavlan 1996; Wang 2002; Yang 1993) or with droperidol (Zhu 2010); semipermanent needles (Andrzejowski 1996); electrical stimulation of needles (Amir 2007; Dundee 1989; El-Deeb 2011; Gan 2004; Ho 1990; Rusy 2002); transcutaneous electrical nerve stimulation (Fassoulaki 1993; Ho 1990), transcutaneous electrical acupoint stimulation (Habib 2006; Wang 2010; Xu 2012), laser stimulation (Butkovic 2005; Schlager 1998); acu-stimulation device (Ertas 2015; Frey 2009a; Frey 2009b; Kim 2004; White 2002; Zárate 2001); and acupressure (Adib-Hajbaghery 2013; Agarwal 2000; Agarwal 2002; Alkaissi 1999; Alkaissi 2002; Allen 1994; Barsoum 1990; Direkvand-Moghadam 2013; Duggal 1998; Ebrahim Soltani 2010; Ferrara-Love 1996; Gieron 1993; Harmon 1999; Harmon 2000; Ho 1996; Iqbal 2012; Klein 2004; Lewis 1991; Majholm 2011; Nilsson 2015; Sadighha 2008; Samad 2003; Schultz 2003; Turgut 2007; White 2012). Three studies used conventional peripheral nerve stimulation (Arnberger 2007; Kim 2011; Liu 2008). One trial used both acupressure and acupuncture (Shenkman 1999). Capsicum plaster at PC6 acupoint was used in two studies (Koo 2013; Misra 2005). The type of surgery; type, timing, and duration of stimulation of the PC6 acupoint; and the follow-up time for assessing PONV varied greatly.

PC6 stimulation was compared with six antiemetic drugs: metoclopramide (Butkovic 2005; Direkvand-Moghadam 2013; Dundee 1989; Ebrahim Soltani 2010; Sadighha 2008); cyclizine (Dundee 1989); prochlorperazine (Barsoum 1990; Ho 1990); droperidol (Schultz 2003; Wang 2002; Yang 1993; Yentis 1992; Zhu 2010); ondansetron (Agarwal 2002; Ebrahim Soltani 2010; El-Deeb 2011; Gan 2004; Misra 2005; Ravi 2010; Sharma 2007; Tavlan 1996; White 2002), dexamethasone plus ondansetron (White 2012).

A combination of PC6 stimulation and antiemetic drug was used as a multimodal therapy in several trials (Schultz 2003; Sharma 2007; Wang 2010; White 2002; White 2012; Xu 2012; Yentis 1992; Zhu 2010).

Excluded studies—We excluded 49 trials. Please see ‘Characteristics of excluded studies’ for more information.

Studies awaiting classification—There are no studies awaiting classification

Ongoing studies—There are two ongoing studies (Cooke 2014; Lv 2013). Please see Characteristics of ongoing studies for more information.

Risk of bias in included studies

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 were two studies with an overall low risk of bias (Gan 2004; Xu 2012), as we rated all key domains 'low risk'. Of the 25 studies with a high risk of bias (one or more key domains were rated 'high risk'), 20 of these were due to selective reporting.

Allocation—Allocation sequence was provided using a computer-generated random numbers table (Agarwal 2000; Amir 2007; Arnberger 2007; Ertas 2015; Gan 2004; Harmon 1999; Ho 1996; Klein 2004; Misra 2005; Ravi 2010; Wang 2010; White 2002; White 2012; Xu 2012; Zárate 2001), a table of random numbers (Agarwal 2002; Direkvand-Moghadam 2013; Duggal 1998; Liu 2008; Samad 2003; Schultz 2003), a block-design procedure (Rusy 2002), a yoking randomization based on a computer-generated list (Wang 2002) and the toss of a dice (Adib-Hajbaghery 2013). Two trials had high risk of selection bias from inadequate sequence generation (Ferrara-Love 1996; Sadighha 2008). Eight of the 59 trials reported adequate allocation concealment (Arnberger 2007; Ertas 2015; Gan 2004; Majholm 2011; Nilsson 2015; Schultz 2003; Streitberger 2004; Xu 2012). In 49 trials the allocation concealment was unclear, and in two trials (Ferrara-Love 1996; Sadighha 2008) it was inadequate.

Blinding—Participants 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). As an outcome assessor was not blinded in three studies (Adib-Hajbaghery 2013; Gieron 1993; Sharma 2007), detection bias was likely to have occurred.

Incomplete outcome data—Three trials were at high risk of attrition bias (Fassoulaki 1993; Harmon 1999; Schultz 2003).

Selective reporting—Twenty trials did not report all four outcomes: postoperative nausea, postoperative vomiting, rescue antiemetic drugs, and adverse events in their studies (Adib-Hajbaghery 2013; Alkaissi 1999; Allen 1994; Barsoum 1990; Butkovic 2005; Direkvand-Moghadam 2013; Ertas 2015; Fassoulaki 1993; Ferrara-Love 1996; Frey 2009a; Habib 2006; Harmon 2000; Ho 1990; Koo 2013; Lewis 1991; Ravi 2010; Sadighha 2008; Schultz 2003; Yang 1993; Yentis 1992).

Other potential sources of bias—All studies except one (Dundee 1989) reported the between-group comparisons of baseline characteristics.

Effects of interventions

See: **Summary of findings for the main comparison** Acupoint PC6 stimulation versus sham for preventing postoperative nausea and vomiting; **Summary of findings 2** Acupoint PC6 stimulation versus antiemetic drug for preventing postoperative nausea and vomiting; **Summary of findings 3** Acupoint PC6 stimulation and antiemetic combination compared to antiemetic for preventing postoperative nausea and vomiting

PC6 acupoint stimulation versus sham treatment—In the few studies (Frey 2009a; Frey 2009b; Streitberger 2004) that directly compared the timing of PC6 acupoint stimulation (pre-versus post-induction), the risk reduction of PONV was similar irrespective of when the acupoint stimulation occurred. Compared to sham acu-stimulation, the odds of nausea within 24 hours after hysterectomy for pre-induction acu-stimulation and post-induction acu-stimulation were 0.31 (95% CI 0.14 to 0.68) and 0.33 (95% CI 0.15 to 0.73) respectively (Frey 2009a). Similarly, compared to sham acu-stimulation, the odds of vomiting within 24 hours after hysterectomy for pre-induction acu-stimulation and post-induction acu-stimulation were 0.37 (95% CI 0.18 to 0.79) and 0.26 (95% CI 0.13 to 0.56) respectively (Frey 2009a). There was no significant difference in the incidence of PONV at two hours after laparoscopic cholecystectomy in the group of acu-stimulation pre-induction compared to post-induction of anaesthesia (Frey 2009b). There was no significant difference in the incidence of PONV at 24 hours when acupuncture was given before induction (RR 0.88, 95% CI 0.60 to 1.28) or after induction (RR 0.82, 95% CI 0.53 to 1.27) (Streitberger 2004).

Primary outcomes

1. Incidence of postoperative nausea: (see Analysis 1.1)

Forty trials examined PC6 acupoint stimulation for the prevention of nausea, in a total of 4742 participants (Analysis 1.1). PC6 acupoint stimulation reduced the incidence of nausea (RR 0.68, 95% CI 0.60 to 0.77) but there was substantial heterogeneity (I^2 statistic = 67%). The ‘trim and fill’ method did not trim or add any more studies to the contour-enhanced funnel plot (Figure 4). The estimated NNTB for different baseline risks of nausea is shown in Table 4.

There was no interaction effect between the subgroup analyses that were prespecified: children versus adults (Analyses 1.1.2, 1.1.3: Chi^2 statistic 0.48, df = 1, P = 0.49); invasive versus noninvasive PC6 acupoint stimulation (Analyses 1.1.4, 1.1.5: Chi^2 statistic 1.52, df = 1, P = 0.22). There was also no interaction between trials at low, unclear and high risk of bias (Analyses 1.1.6, 1.1.7, 1.1.8; Chi^2 statistic 1.46, df = 2, P = 0.48) or for control event rates (up to 20% or more than 20%) (Analyses 1.1.9, 1.1.10: Chi^2 statistic 0.44, df = 1, P = 0.51).

As the heterogeneity among trials was substantial and there were study limitations, we downgraded the evidence from high to low quality. Using trial sequential analysis, the required information size and boundary for benefit were reached for nausea (Figure 5).

2. Incidence of postoperative vomiting, defined as either retching or vomiting, or both: (see Analysis 1.2)

Forty-five trials examined PC6 acupoint stimulation for the prevention of vomiting, in 5147 participants. PC6 acupoint stimulation reduced the incidence of vomiting (RR 0.60, 95% CI 0.51 to 0.71) but there was substantial heterogeneity (I^2 statistic = 64%). The 'trim and fill' method did not trim or add any more studies to the contour-enhanced funnel plot (Figure 6). The estimated NNTB for different baseline risks of vomiting is shown in Table 4.

There was no interaction effect between subgroup analyses that were prespecified: children versus adults (Analyses 1.2.2, 1.2.3: Chi^2 statistic 0.33, df = 1, P = 0.63); invasive versus noninvasive PC6 acupoint stimulation (Analyses 1.2.4, 1.2.5: Chi^2 statistic 0.56, df = 1, P = 0.45). There was also no interaction between trials at low, unclear and high risk of bias (Analyses 1.2.6, 1.2.7, 1.2.8; Chi^2 statistic 0.30, df = 2, P = 0.86) or for control event rates (up to 20% or more than 20%) (Analyses 1.2.9, 1.2.10: Chi^2 statistic 1.39, df = 1, P = 0.24).

As the heterogeneity among trials was substantial and there were study limitations, we downgraded the evidence from high to low quality. Using trial sequential analysis, the required information size and boundary for benefit were reached for vomiting (Figure 7).

Secondary outcomes

1. Need for rescue antiemetic drug when prophylaxis failed: (Analysis 1.3)

The need for a rescue antiemetic was less after PC6 stimulation compared to sham treatment in 39 trials involving 4622 participants (RR 0.64, 95% CI 0.55 to 0.73). There was moderate heterogeneity (I^2 statistic = 44%). 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). We downgraded the evidence from high to low quality because of inconsistency between trials and study limitations.

2. Adverse effects from PC6 acupoint stimulation and/or antiemetic drug: Overall, the side effects associated with PC6 acupoint stimulation were minor and self limiting. There were no side effects for participants receiving acupuncture (Dundee 1986; Dundee 1989; Sharma 2007; Wang 2002; Zhu 2010); electroacupuncture (El-Deeb 2011); acupressure (Agarwal 2000; Agarwal 2002; Gieron 1993; Harmon 1999; Ho 1996; Klein 2004; Lewis 1991; Samad 2003); or transcutaneous electro-acupoint stimulation (Arnberger 2007; Gan 2004; Kim 2011; Liu 2008; Wang 2010; Xu 2012).

Haematomas occurred in one participant in the acupuncture group and in two participants in the placebo acupuncture group (Streitberger 2004). 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 PC6 acupoint stimulation and sham treatment groups (Shenkman 1999). Participants complained of feeling tired and sleepy during electro-acupuncture stimulation (Ho 1990) or had erythema (Amir 2007).

Although no side effects were reported with acu-stimulation (Ertas 2015; White 2002), another trial reported mild cutaneous irritation (Zárate 2001). Three trials (Alkaissi 2002;

Barsoum 1990; Duggal 1998) reported that acupressure bands felt uncomfortable, produced red indentation or itching, headache and dizziness, swollen wrists, and blistering at the site of the button. One participant in the acupressure group withdrew from a trial due to swelling and erythema of the wrist (Turgut 2007). The incidence of redness, tenderness, paraesthesia and swelling was similar between active and sham acupressure wristband groups (Majholm 2011; Nilsson 2015). One participant complained of mild irritation at the site of capsicum plaster application (Misra 2005).

PC6 acupoint stimulation versus antiemetic drug

Primary outcomes

1. Incidence of postoperative nausea: (Analysis 2.1)

Compared to antiemetic drugs, there was no difference in the incidence of postoperative nausea associated with PC6 acupoint stimulation (Analysis 2.1.5: RR 0.91, 95% CI 0.75 to 1.10) in 14 trials involving 1332 participants. There was minor heterogeneity between the trials (I^2 statistic = 16%). The 'trim and fill' method did not trim or add any more studies to the contour-enhanced funnel plot (Figure 8). We found no interaction effect between the different types of antiemetic drugs (ondansetron, metoclopramide, cyclizine, droperidol) for comparison with PC6 acupoint stimulation (Analyses 2.1.1 to 2.1.4: Chi^2 statistic 1.10, df = 3, P = 0.78).

There was no interaction effect between subgroup analyses that were prespecified: children versus adults (Analyses 2.1.6, 2.1.7: Chi^2 statistic 1.49, df = 1, P = 0.22); invasive versus noninvasive PC6 acupoint stimulation (Analyses 2.1.8, 2.1.9: Chi^2 statistic 1.38, df = 1, P = 0.24). There was weak evidence for an interaction effect between trials at low, unclear and high risk of bias (Analyses 2.1.10, 2.1.11, 2.1.12; Chi^2 statistic 5.36, df = 2, P = 0.07). There was no interaction effect between control event rate groups (up to 20% or more than 20%) (Analyses 2.1.13, 2.1.14: Chi^2 statistic 0, df = 1, P = 0.97).

As there were study limitations, we downgraded the evidence from high to moderate quality. Using trial sequential analysis, the boundary for futility was reached for nausea (Figure 9).

2. Incidence of postoperative vomiting, defined as either retching or vomiting, or both: (Analysis 2.2)

Compared to antiemetic drugs, there was no difference in the incidence of postoperative vomiting associated with PC6 acupoint stimulation (Analysis 2.2.6: RR 0.93, 95% CI 0.74 to 1.17) in 19 trials involving 1708 participants. Trial results were homogeneous (I^2 = 0%). The 'trim and fill' method did not trim or add any more studies to the contour-enhanced funnel plot (Figure 10). There was no interaction effect between the different types of antiemetic drugs used for comparisons with PC6 acupoint stimulation (Chi^2 statistic 0.71, df = 4, P = 0.95).

There was no interaction effect between subgroup analyses that were prespecified: children versus adults (Analyses 2.2.7, 2.2.8: Chi^2 statistic 0.03, df = 1, P = 0.87); invasive versus noninvasive PC6 acupoint stimulation (Analyses 2.2.9, 2.2.10: Chi^2 statistic 0.19, df = 1, P =

0.66). There was no interaction effect between trials at low, unclear and high risk of bias (Analyses 2.2.11, 2.2.12, 2.2.13; Chi^2 statistic 0.32, df = 2, P = 0.85). There was no interaction effect between control event rate groups (up to 20% or more than 20%) (Analyses 2.2.14, 2.2.15: Chi^2 statistic 0.01, df = 1, P = 0.94).

As there were study limitations, we downgraded the evidence from high to moderate quality. Using trial sequential analysis, the boundary for futility was reached for vomiting (Figure 11).

Secondary outcomes

1. Need for rescue antiemetic drug when prophylaxis failed: (Analysis 2.3)

There was no difference in the incidence of requiring rescue antiemetics for PC6 acupoint stimulation compared to pooled antiemetic drugs (RR 0.87, 95% CI 0.65 to 1.16) in nine trials involving 895 participants. Trial results were homogeneous (I^2 statistic = 0%). The evidence was of moderate quality due to study limitations.

2. Adverse effects from PC6 acupoint stimulation or antiemetic drug, or both: Restlessness was less frequent in the acupuncture group than after droperidol (RR 0.47, 95% CI 0.26 to 0.87) (Yentis 1992). While there was no puncture site redness, irritation or vasovagal effects (Sharma 2007; Wang 2002), another study reported pain associated with acupuncture (Yang 1993). There was no drowsiness, anxiety or extrapyramidal reactions found in participants given acupuncture or droperidol (Zhu 2010). No complications associated with electro-acupuncture, electro-acupuncture stimulation, acu-stimulation, acupressure, ondansetron were noted in several trials (Agarwal 2002; El-Deeb 2011; Gan 2004; Misra 2005; White 2002). Of the 49 participants in the acupressure wristband group, four reported some local tightness and discomfort (Barsoum 1990).

PC6 acupoint stimulation and antiemetic combination versus sham—One trial examined this comparison of wristband and droperidol versus sham wristband and placebo drug (Schultz 2003). There was no difference between groups for the incidence of nausea (RR 1.19, 95% CI 0.91 to 1.55) and vomiting (RR 1.18, 95% CI 0.63 to 2.21).

PC6 acupoint stimulation and antiemetic combination versus antiemetic

Primary outcomes

1. Incidence of postoperative nausea: Analysis (Analysis 3.1)

The eight trials (n = 642) evaluating the combination of PC6 acupoint stimulation and antiemetic versus antiemetic for preventing postoperative nausea were all conducted in adults. There was no difference in the incidence of postoperative nausea between groups (Analysis 3.1.4: RR 0.79, 95% CI 0.55 to 1.13). There was substantial heterogeneity between the trials (I^2 statistic = 72%), which may be explained by the level of invasiveness of the PC6 acupoint stimulation (Analysis 3.1.5 and 3.1.6: subgroup interaction effect was significant, P = 0.03). We found no interaction effect between the different types of PC6 acupoint stimulation antiemetic drug combinations (Chi^2 statistic 0.23, df = 2, P = 0.89);

level of risk of bias of trials (Chi^2 statistic 2.14, df = 2, P = 0.34) or control event rate groups (Chi^2 statistic 1.35, df = 1, P = 0.25).

We downgraded the evidence from high to very low quality due to substantial heterogeneity among the trials, study limitations and imprecision of the summary estimate. Using trial sequential analysis, none of the boundaries for benefit, harm or futility were crossed and the required information size of 1743 was far from being reached (Figure 12).

2. Incidence of postoperative vomiting, defined as either retching or vomiting, or both: Analysis (Analysis 3.2)

Compared to the antiemetic control groups, the combination of PC6 acupoint stimulation and antiemetic reduced the incidence of vomiting in nine trials involving 687 participants (Analysis 3.2.4: RR 0.56, 95% CI 0.35 to 0.91). There was substantial heterogeneity between the trials (I^2 = 61%). There was no interaction effect between different age groups (Analysis 3.2.5 and 3.2.6: Chi^2 statistic 1.17, df = 1, P = 0.28), level of invasiveness of the PC6 acupoint stimulation (Analysis 3.2.7 and 3.2.8: Chi^2 statistic 0.73, df = 1, P = 0.39), level of risk of bias of trials (Chi^2 statistic 0.01, df = 2, P = 1.00) or control event rate (Chi^2 statistic 1.97, df = 1, P = 0.16).

As there was substantial heterogeneity among trials, study limitations and imprecision of the summary estimate, we downgraded the evidence from high to very low quality. Using trial sequential analysis, none of the boundaries for benefit, harm or futility were crossed and the required information size of 2058 was far from being reached (Figure 13).

Secondary outcomes

1. Need for rescue antiemetic drug when prophylaxis failed: Analysis (Analysis 3.3)

The most common type of rescue antiemetic used for PC6 acupoint stimulation and antiemetic combination was metoclopramide (Sharma 2007; Wang 2010; White 2002; Xu 2012). One trial used both metoclopramide and prochlorperazine as rescue antiemetics (White 2012). Overall, participants in the PC6 acupoint stimulation and antiemetic combination group were less likely to require rescue antiemetic than the antiemetic-only comparison group (RR 0.61, 95% CI: 0.44 to 0.86) with no heterogeneity (I^2 statistic = 0%) in five trials involving 419 participants. As there were study limitations and imprecision, we rated the overall quality of evidence as low.

2. Adverse effects from PC6 acupoint stimulation and/or antiemetic drug: No major adverse effects were reported in several trials (Sharma 2007; Wang 2010; White 2002; Xu 2012; Zhu 2010). The incidence of headache, fatigue, drowsiness, dizziness, constipation and local discomfort were similar between groups (White 2012).

ADDITIONAL SUMMARY OF FINDINGS [Explanation]

Acupoint PC6 stimulation versus antiemetic drug for preventing postoperative nausea and vomiting						
Patient or population: People at risk of postoperative nausea and vomiting **Settings: Surgery** **Intervention: Acupoint PC6 stimulation** **Comparison: Antiemetic drug**						
Outcomes	**Illustrative comparative risks* (95% CI)**		**Relative effect (95% CI)**	**No of Participants (studies)**	**Quality of the evidence (GRADE)**	**Comments**
	Assumed risk	**Corresponding risk**				
	Antiemetic	**Acupoint PC6 stimulation**				
Nausea - All antiemetics combined	**Low**		**RR 0.91** (0.75 to 1.10)	1332 (14 studies)	⊕⊕⊕○ **moderate**[1]	
	200 per 1000	**182 per 1000** (150 to 220)				
	Moderate					
	400 per 1000	**364 per 1000** (300 to 440)				
	High					
	600 per 1000	**546 per 1000** (450 to 660)				
Vomiting - All antiemetics combined	**Low**		**RR 0.93** (0.74 to 1.17)	1708 (19 studies)	⊕⊕⊕○ **moderate**[2]	
	200 per 1000	**186 per 1000** (148 to 234)				
	Moderate					
	400 per 1000	**372 per 1000** (296 to 468)				
	High					
	600 per 1000	**558 per 1000** (444 to 702)				
Rescue antiemetic	**150 per 1000**	**130 per 1000** (97 to 174)	**RR 0.87** (0.65 to 1.16)	895 (9 studies)	⊕⊕⊕○ **moderate**[3]	
Adverse effects	See comment	See comment	Not estimable	11 studies[4]	Not applicable	See footnote[4]

*The basis for the **assumed risks** for nausea and vomiting is from a consensus panel (Gan 2014) using Apfel's simplified risk score (Apfel 1999). The assumed risk for rescue antiemetic is the median antiemetic group risk across studies. 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 evidence
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] Of the 14 trials, 5 had one or more high risk of bias domains (downgrade 1 point due to study limitations).

[2] Of the 19 trials, 10 had one or more high risk of bias domains (downgrade 1 point due to study limitations).

[3] Of the 9 trials, 3 had one or more high risk of bias domains (downgrade 1 point due to study limitations).

[4] Eight trials reported no side effects. Three trials reported adverse effects (e.g.. restlessness and pain with acupuncture; local tightness and discomfort with acupressure wristbands).

Acupoint PC6 stimulation and antiemetic combination compared to antiemetic for preventing postoperative nausea and vomiting

Patient or population: People at risk of postoperative nausea and vomiting
Settings: Surgery
Intervention: Acupoint PC6 stimulation and antiemetic combination
Comparison: Antiemetic drug

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Antiemetic	Acupoint PC6 stimulation and antiemetic combination				
Nausea	**Low**		**RR 0.79** (0.55 to 1.13)	642 (8 studies)	⊕◯◯◯ **very low**[1,2,3]	
	200 per 1000	**158 per 1000** (110 to 226)				
	Moderate					
	400 per 1000	**316 per 1000** (220 to 452)				
	High					
	600 per 1000	**474 per 1000** (330 to 678)				
Vomiting	**Low**		**RR 0.56** (0.35 to 0.91)	687 (9 studies)	⊕◯◯◯ **very low**[3,4,5]	
	200 per 1000	**112 per 1000** (70 to 182)				
	Moderate					
	400 per 1000	**224 per 1000** (140 to 364)				
	High					
	600 per 1000	**336 per 1000** (210 to 546)				
Rescue antiemetic	**316 per 1000**	**193 per 1000** (139 to 272)	**RR 0.61** (0.44 to 0.86)	419 (5 studies)	⊕⊕◯◯ **low**[3,6]	
Adverse effects	See comment	See comment	Not estimable	6 studies[7]	Not applicable	See footnote[7]

*The basis for the **assumed risks** for nausea and vomiting is from a consensus panel (Gan 2014) using Apfel's simplified risk score (Apfel 1999). The assumed risk for rescue antiemetic is the median antiemetic group risk across studies. 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 evidence
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] Of the 8 trials, 2 had one or more high risk of bias domains (downgrade 1 point due to study limitations).

[2] Substantial heterogeneity present (downgrade 1 point due to inconsistency).

[3] Optimal information size is far from reached and/or total number of events is less than 300 (downgrade 1 point due to imprecision).

[4] Of the 9 trials, 3 had one or more high risk of bias domains (downgrade 1 point due to study limitations).

[5] Moderate amount of heterogeneity (downgrade 1 point due to inconsistency).

[6] Of the 5 trials, 1 had one or more high risk of bias domains (downgrade 1 point due to study limitations).

[7] No major adverse effects reported in the trials.

DISCUSSION

Summary of main results

We have shown that PC6 acupoint stimulation reduced the incidence of postoperative nausea and vomiting (PONV) compared to sham treatment. PC6 acupoint stimulation prevented postoperative nausea, vomiting, and need for antiemetic rescue by similar amounts that can be considered clinically significant (see Summary of findings for the main comparison). However, the reasons for substantial heterogeneity are unclear and do not appear to be related to age, invasiveness level of the PC6 acupoint stimulation, risk of bias levels or control event rate, since there were no significant subgroup interactions effects. Nevertheless, compared to sham treatment, the reduction in the incidences of nausea, vomiting, and need for rescue antiemetics with PC6 acupoint stimulation may reduce costs (such as antiemetic drug cost, length of stay in hospital) as well as improve quality of patient care. However, the costs and quality of patient care were not outcomes examined in this systematic review.

Our results suggest that the PC6 acupoint stimulation was as effective as an antiemetic prophylaxis therapy for reducing the incidences of PONV (see Summary of findings 2). However, there was inconclusive evidence for combining PC6 acupoint stimulation and antiemetic as a multimodal approach for preventing PONV (see Summary of findings 3). Many trials either reported no adverse side effects or minor, transient side effects associated with PC6 acupoint stimulation.

New highlights of this review include the results of the trial sequential analyses: (1) no further PC6 acupoint stimulation versus sham trials are needed, and (2) further PC6 acupoint stimulation versus antiemetic trials are futile in showing a significant difference.

Overall completeness and applicability of evidence

The participants included this systematic review are representative of people with varying underlying risk factors for PONV undergoing a range of surgical procedures with various prophylactic antiemetic regimens. The trials were conducted in middle- and high-income countries. Therefore, the results of this systematic review are directly applicable to clinical practice.

A lack of evidence on the optimal timing, duration and method of PC6 acupoint stimulation (Streitberger 2011) may explain the low uptake of PC6 acupoint stimulation in current clinical practice. In the few studies (Frey 2009a; Frey 2009b; Streitberger 2004) that have directly compared the timing of PC6 acupoint stimulation (pre- versus post-induction), the risk reduction of PONV was similar irrespective of when the PC6 acupoint stimulation

occurred. No trials in this systematic review compared different durations of PC6 acupoint stimulation. The noninvasive techniques may be more acceptable to anaesthesiologists and patients, as little training is needed to accurately locate the site of PC6 acupoint and administer the stimulation via appropriate devices. Generally, we found no subgroup interaction effects between invasive and noninvasive PC6 acupoint stimulation techniques in all the comparisons examined in this systematic review.

Although outside the scope of this systematic review, the cost effectiveness of PC6 acupoint stimulation has not been examined and would require the collection of direct and indirect healthcare costs related to PC6 acupoint stimulation and antiemetic prophylaxis, and data on the length of stay in hospital, and time to resume normal diet, sleep pattern and normal activities.

Quality of the evidence

The quality of evidence was variable, depending on the PC6 acupoint stimulation intervention and comparison group examined. The degree of risk of biases across trials also varied, with few trials (Gan 2004; Xu 2012) rated at low risk of bias. Selective reporting of outcomes was the most common risk of bias. The need for rescue antiemetic and side effects associated with PC6 acupoint stimulation and antiemetics were outcomes not always collected and reported. Thus, the impact of selective reporting bias on the summary effect estimates is unknown. When there was substantial heterogeneity, the reasons were often unknown. There may be subtle differences between inactive ReliefBand and SeaBands with studs removed, when placed over the PC6 acupoint. Despite possible differences in sham efficacy and intrinsic bias, we analysed these sham treatments as one group. The evidence base is likely to remain low when PC6 acupoint stimulation is compared to sham, since the threshold for a statistically significant treatment effect has been reached. The evidence base for PC6 acupoint stimulation as an alternative to antiemetic is likely to remain moderate, as the threshold for futility has been reached.

Potential biases in the review process

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. The addition of another 19 studies examining PC6 acupoint stimulation for PONV since the previous version of this review (Lee 2009) did not change the relative risk estimates much. Thus, we are confident that publication bias is minimal in this review.

Agreements and disagreements with other studies or reviews

The results of this updated Cochrane review cannot be directly compared with those reported by Cheong 2013, as the methodology was different. For example, there were differences in the selection of controls, inclusion of other acupoints with PC6, timing of PONV and types of PC6 acupoint stimulation technique subgroup analyses chosen. Nevertheless, the results of PC6 electro-acupoint stimulation versus sham for postoperative nausea (RR 0.49, 95% CI 0.38 to 0.63) and postoperative vomiting (RR 0.50, 95% CI 0.36 to 0.70) in the first 24 hours (Cheong 2013) are in agreement with our review.

AUTHORS' CONCLUSIONS

Implications for practice

Given that adverse effects associated with PC6 acupoint stimulation are minor and transient, the number needed to treat for an additional beneficial (NNTB) outcome (Table 4) suggests that P6 acupoint stimulation is worthwhile when the baseline risk of PONV is high (i.e. above 60% as defined by Gan 2014). For example, the NNTB (95% CI) is 5 (4 to 7) for nausea and 4 (3 to 6) for vomiting at baseline risk of 60%. PC6 acupoint stimulation may be considered as an alternative to antiemetics in people in whom exposure is undesirable, for example, pregnant or breast-feeding women, and those with contraindications to antiemetics (Streitberger 2011). We do not have sufficient evidence to determine the effects of multimodal PC6 acupoint stimulation and antiemetic on the prevention of PONV.

Implications for research

The results of the trial sequential analyses suggest that no further PC6 acupoint stimulation versus sham trials are needed, and that further PC6 acupoint stimulation versus antiemetic trials would be futile in showing a significant difference. There is a need for high-quality trials to examine whether combinations of PC acupoint stimulation and antiemetic interventions (that is, multimodal prophylaxis) works better than each component alone and whether they interact. An ongoing trial (Lv 2013) may provide more insight into the comparative effectiveness of combining ondansetron and acupuncture against ondansetron and transcutaneous electrical nerve stimulation of PC6 acupoint. More importantly, future trials should include more clinically relevant outcomes, such as quality of recovery, to draw meaningful conclusions.

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* Indicates the major publication for the study

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APPENDICES

Appendix 1. Search strategy for CENTRAL, The Cochrane Library

#1	MeSH descriptor postoperative complications explode all trees
#2	MeSH descriptor Postoperative Nausea and Vomiting explode all trees
#3	MeSH descriptor nausea explode all trees

#4 MeSH 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)

#7 MeSH descriptor acupuncture explode all trees

#8 MeSH descriptor acupuncture therapy explode all trees

#9 MeSH descriptor acupuncture points explode all trees

#10 MeSH descriptor acupressure explode all trees

#11 MeSH descriptor Transcutaneous Electric Nerve Stimulation explode all trees

#12 MeSH descriptor electroacupuncture explode all trees

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

#14 acupressure in All Text

#15 acupunct* 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 (Ovid SP)

1. exp Postoperative Complications/
2. exp Postoperative Nausea/
3. exp nausea/
4. exp vomiting/
5. (nausea or vomiting or emesis).mp.
6. or/1–5
7. exp acupuncture/
8. exp acupuncture therapy/
9. exp acupuncture points/
10. exp acupressure/
11. exp Transcutaneous Electric Nerve Stimulation/
12. exp electroacupuncture/
13. electro?acupunct*.mp.
14. acupressure.mp.
15. acupunct*.mp.

16. (electro* adj6 (nerv* and stimulat*)).mp.
17. or/7–16
18. 6 and 17
19. (CLINICAL-TRIAL.pt. or randomized.ab. or placebo.ab. or clinical trials.sh. or randomly.ab. or trial.ti.) and humans.sh.
20. 18 and 19
21. limit 20 to yr="2008 -Current"

Appendix 3. Search strategy for SilvePlatter EMBASE (Ovid SP)

1. exp postoperative complication/
2. exp postoperative nausea/
3. exp postoperative vomiting/
4. exp nausea/
5. exp vomiting/
6. (nausea or vomiting or emesis).mp.
7. or/1–6
8. exp acupuncture/
9. exp acupuncture analgesia/
10. exp electroacupuncture/
11. exp acupressure/
12. exp transcutaneous nerve stimulation/
13. (acupressure or acupunct* or electro?acupunct*).mp.
14. (electro* adj6 (nerv* and stimulat*)).mp.
15. or/8–14
16. 7 and 15
17. RANDOMIZATION/
18. RANDOMIZED-CONTROLLED-TRIAL/
19. CONTROLLED-STUDY/
20. MULTICENTER-STUDY/
21. (RANDOM* or CROSS?OVER* or FACTORIAL* or PLACEBO* or VOLUNTEER*).ti,ab.
22. ((SINGL* or DOUBL* or TREBL* or TRIPL*) adj6 (BLIND* or MASK*)).ti,ab.
23. or/17–22

24. 23 and 16

25. limit 24 to yr="2008 -Current"

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) AND TS=(nerv* AND stimulat*)

#6 #5 OR #4

#7 TS=(random* or clinical or control* or multi$cent* SAME trial* or stud*)

#8 TS=(singl* or doubl* or trebl* or tripl* SAME 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

DATA AND ANALYSES

Comparison 1. Acupoint PC6 stimulation versus sham

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Nausea	40		Risk Ratio (IV, Random, 95% CI)	Subtotals only
1.1 All trials	40	4742	Risk Ratio (IV, Random, 95% CI)	0.68 [0.60, 0.77]
1.2 Children	2	258	Risk Ratio (IV, Random, 95% CI)	0.63 [0.51, 0.80]
1.3 Adults	36	4344	Risk Ratio (IV, Random, 95% CI)	0.70 [0.61, 0.79]
1.4 Invasive PC6 stimulation	7	896	Risk Ratio (IV, Random, 95% CI)	0.56 [0.39, 0.80]
1.5 Noninvasive PC6 stimulation	33	3846	Risk Ratio (IV, Random, 95% CI)	0.71 [0.62, 0.81]
1.6 Low risk of bias trials	2	169	Risk Ratio (IV, Random, 95% CI)	0.40 [0.17, 0.93]
1.7 Unclear risk of bias trials	20	2496	Risk Ratio (IV, Random, 95% CI)	0.68 [0.56, 0.82]
1.8 High risk of bias trials	11	1090	Risk Ratio (IV, Random, 95% CI)	0.68 [0.55, 0.85]
1.9 Trials with control event rate less than or equal to 20%	4	454	Risk Ratio (IV, Random, 95% CI)	0.81 [0.49, 1.33]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.10 Trials with control event rate more than 20%	36	4288	Risk Ratio (IV, Random, 95% CI)	0.68 [0.59, 0.77]
2 Vomiting	45		Risk Ratio (IV, Random, 95% CI)	Subtotals only
2.1 All trials	45	5147	Risk Ratio (IV, Random, 95% CI)	0.60 [0.51, 0.71]
2.2 Children	6	542	Risk Ratio (IV, Random, 95% CI)	0.67 [0.46, 0.97]
2.3 Adults	37	4465	Risk Ratio (IV, Random, 95% CI)	0.61 [0.51, 0.72]
2.4 Invasive PC6 stimulation	7	896	Risk Ratio (IV, Random, 95% CI)	0.51 [0.34, 0.76]
2.5 Noninvasive PC6 stimulation	37	4151	Risk Ratio (IV, Random, 95% CI)	0.60 [0.50, 0.73]
2.6 Low risk of bias trials	2	169	Risk Ratio (IV, Random, 95% CI)	0.52 [0.31, 0.88]
2.7 Unclear risk of bias trials	26	3583	Risk Ratio (IV, Random, 95% CI)	0.59 [0.48, 0.72]
2.8 High risk of bias trials	14	1373	Risk Ratio (IV, Random, 95% CI)	0.62 [0.45, 0.83]
2.9 Trials with control event rate less than or equal to 20%	12	1556	Risk Ratio (IV, Random, 95% CI)	0.75 [0.51, 1.11]
2.10 Trials with control event rate more than 20%	33	3591	Risk Ratio (IV, Random, 95% CI)	0.58 [0.48, 0.69]
3 Rescue antiemetics	39	4622	Risk Ratio (IV, Random, 95% CI)	0.64 [0.55, 0.73]

Comparison 2. Acupoint PC6 stimulation versus antiemetic drug

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Nausea	14		Risk Ratio (IV, Random, 95% CI)	Subtotals only
1.1 Ondansetron	9	843	Risk Ratio (IV, Random, 95% CI)	0.86 [0.65, 1.13]
1.2 Metoclopramide	4	334	Risk Ratio (IV, Random, 95% CI)	0.72 [0.38, 1.36]
1.3 Cyclizine	1	62	Risk Ratio (IV, Random, 95% CI)	0.5 [0.14, 1.82]
1.4 Droperidol	2	143	Risk Ratio (IV, Random, 95% CI)	1.02 [0.47, 2.19]
1.5 All antiemetics combined	14	1332	Risk Ratio (IV, Random, 95% CI)	0.91 [0.75, 1.10]
1.6 Children	1	99	Risk Ratio (IV, Random, 95% CI)	0.68 [0.41, 1.13]
1.7 Adult	11	1033	Risk Ratio (IV, Random, 95% CI)	0.96 [0.78, 1.17]
1.8 Invasive PC6 stimulation	5	559	Risk Ratio (IV, Random, 95% CI)	0.69 [0.41, 1.14]
1.9 Noninvasive PC6 stimulation	9	773	Risk Ratio (IV, Random, 95% CI)	0.95 [0.78, 1.16]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.10 Low risk of bias trials	1	51	Risk Ratio (IV, Random, 95% CI)	0.48 [0.19, 1.21]
1.11 Unclear risk of bias trials	8	975	Risk Ratio (IV, Random, 95% CI)	0.81 [0.63, 1.04]
1.12 High risk of bias trials	5	306	Risk Ratio (IV, Random, 95% CI)	1.07 [0.89, 1.29]
1.13 Trials with control event rate less than or equal to 20%	6	685	Risk Ratio (IV, Random, 95% CI)	0.89 [0.52, 1.52]
1.14 Trials with control event rate more than 20%	8	647	Risk Ratio (IV, Random, 95% CI)	0.88 [0.69, 1.13]
2 Vomiting	19		Risk Ratio (IV, Random, 95% CI)	Subtotals only
2.1 Ondansetron	9	843	Risk Ratio (IV, Random, 95% CI)	1.02 [0.68, 1.54]
2.2 Metoclopramide	5	414	Risk Ratio (IV, Random, 95% CI)	0.87 [0.43, 1.74]
2.3 Prochlorperazine	2	173	Risk Ratio (IV, Random, 95% CI)	1.15 [0.48, 2.77]
2.4 Cyclizine	1	62	Risk Ratio (IV, Random, 95% CI)	0.67 [0.21, 2.13]
2.5 Droperidol	4	266	Risk Ratio (IV, Random, 95% CI)	0.96 [0.64, 1.43]
2.6 All antiemetics combined	19	1708	Risk Ratio (IV, Random, 95% CI)	0.93 [0.74, 1.17]
2.7 Children	3	237	Risk Ratio (IV, Random, 95% CI)	0.98 [0.61, 1.56]
2.8 Adult	14	1271	Risk Ratio (IV, Random, 95% CI)	0.94 [0.72, 1.22]
2.9 Invasive PC6 stimulation	8	734	Risk Ratio (IV, Random, 95% CI)	0.99 [0.70, 1.41]
2.10 Noninvasive PC6 stimulation	12	974	Risk Ratio (IV, Random, 95% CI)	0.90 [0.67, 1.21]
2.11 Low risk of bias trials	1	51	Risk Ratio (IV, Random, 95% CI)	1.44 [0.26, 7.92]
2.12 Unclear risk of bias trials	8	975	Risk Ratio (IV, Random, 95% CI)	0.96 [0.66, 1.40]
2.13 High risk of bias trials	10	682	Risk Ratio (IV, Random, 95% CI)	0.91 [0.68, 1.21]
2.14 Trials with control event rate less than or equal to 20%	15	1440	Risk Ratio (IV, Random, 95% CI)	0.95 [0.70, 1.29]
2.15 Trials with control event rate more than 20%	4	268	Risk Ratio (IV, Random, 95% CI)	0.93 [0.60, 1.43]
3 Rescue antiemetic	9	895	Risk Ratio (IV, Random, 95% CI)	0.87 [0.65, 1.16]

Comparison 3. Acupoint PC6 stimulation and antiemetic combination vs antiemetic

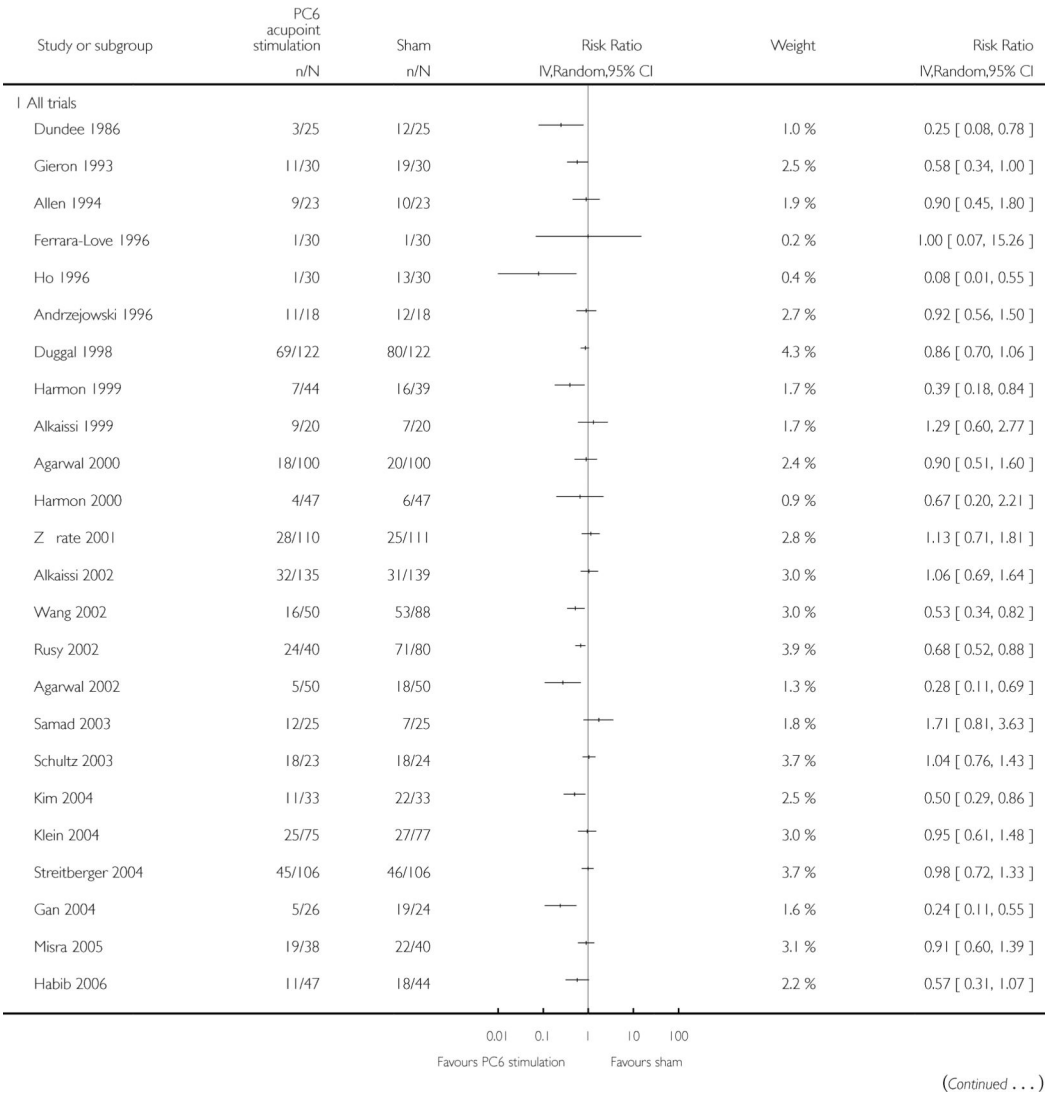
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Nausea	8		Risk Ratio (IV, Random, 95% CI)	Subtotals only
1.1 PC6 acupoint stimulation and droperidol	2	128	Risk Ratio (IV, Random, 95% CI)	0.77 [0.15, 4.10]
1.2 PC6 acupoint stimulation and ondansetron	4	295	Risk Ratio (IV, Random, 95% CI)	0.79 [0.47, 1.33]
1.3 PC6 acupoint stimulation, dexamethasone and ondansetron	2	219	Risk Ratio (IV, Random, 95% CI)	0.69 [0.50, 0.93]
1.4 All PC6 acupoint stimulation and antiemetic combinations	8	642	Risk Ratio (IV, Random, 95% CI)	0.79 [0.55, 1.13]
1.5 Invasive PC6 stimulation	2	120	Risk Ratio (IV, Random, 95% CI)	0.28 [0.11, 0.75]
1.6 Noninvasive PC6 stimulation	6	522	Risk Ratio (IV, Random, 95% CI)	0.88 [0.62, 1.25]
1.7 Low risk of bias trials	1	119	Risk Ratio (IV, Random, 95% CI)	0.58 [0.38, 0.88]
1.8 Unclear risk of bias trials	4	355	Risk Ratio (IV, Random, 95% CI)	0.86 [0.61, 1.20]
1.9 High risk of bias trials	3	168	Risk Ratio (IV, Random, 95% CI)	0.58 [0.12, 2.66]
1.10 Trials with control event rate less than or equal to 20%	1	40	Risk Ratio (IV, Random, 95% CI)	0.14 [0.01, 2.60]
1.11 Trials with control event rate more than 20%	7	602	Risk Ratio (IV, Random, 95% CI)	0.81 [0.56, 1.16]
2 Vomiting	9		Risk Ratio (IV, Random, 95% CI)	Subtotals only
2.1 PC6 acupoint stimulation and droperidol	3	173	Risk Ratio (IV, Random, 95% CI)	0.62 [0.19, 1.99]
2.2 PC6 acupoint stimulation and ondansetron	4	295	Risk Ratio (IV, Random, 95% CI)	0.51 [0.20, 1.30]
2.3 PC6 acupoint stimulation and dexamethasone and ondansetron	2	219	Risk Ratio (IV, Random, 95% CI)	0.49 [0.30, 0.79]
2.4 All PC6 acupoint stimulation and antiemetic combinations	9	687	Risk Ratio (IV, Random, 95% CI)	0.56 [0.35, 0.91]
2.5 Children	1	60	Risk Ratio (IV, Random, 95% CI)	0.83 [0.43, 1.63]
2.6 Adult	8	627	Risk Ratio (IV, Random, 95% CI)	0.51 [0.29, 0.91]
2.7 Invasive PC6 stimulation	3	180	Risk Ratio (IV, Random, 95% CI)	0.34 [0.08, 1.40]
2.8 Noninvasive PC6 stimulation	6	507	Risk Ratio (IV, Random, 95% CI)	0.65 [0.38, 1.11]
2.9 Low risk of bias trials	1	119	Risk Ratio (IV, Random, 95% CI)	0.53 [0.30, 0.94]
2.10 Unclear risk of bias trials	4	355	Risk Ratio (IV, Random, 95% CI)	0.52 [0.25, 1.09]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.11 High risk of bias trials	4	213	Risk Ratio (IV, Random, 95% CI)	0.56 [0.19, 1.64]
2.12 Trials with control event rate less than or equal to 20%	2	120	Risk Ratio (IV, Random, 95% CI)	0.13 [0.02, 1.04]
2.13 Trials with control event rate more than 20%	7	567	Risk Ratio (IV, Random, 95% CI)	0.61 [0.37, 1.00]
3 Rescue antiemetic	5	419	Risk Ratio (IV, Random, 95% CI)	0.61 [0.44, 0.86]

Review: Stimulation of the wrist acupuncture point PC6 for preventing postoperative nausea and vomiting

Comparison: 1 Acupoint PC6 stimulation versus sham

Outcome: 1 Nausea



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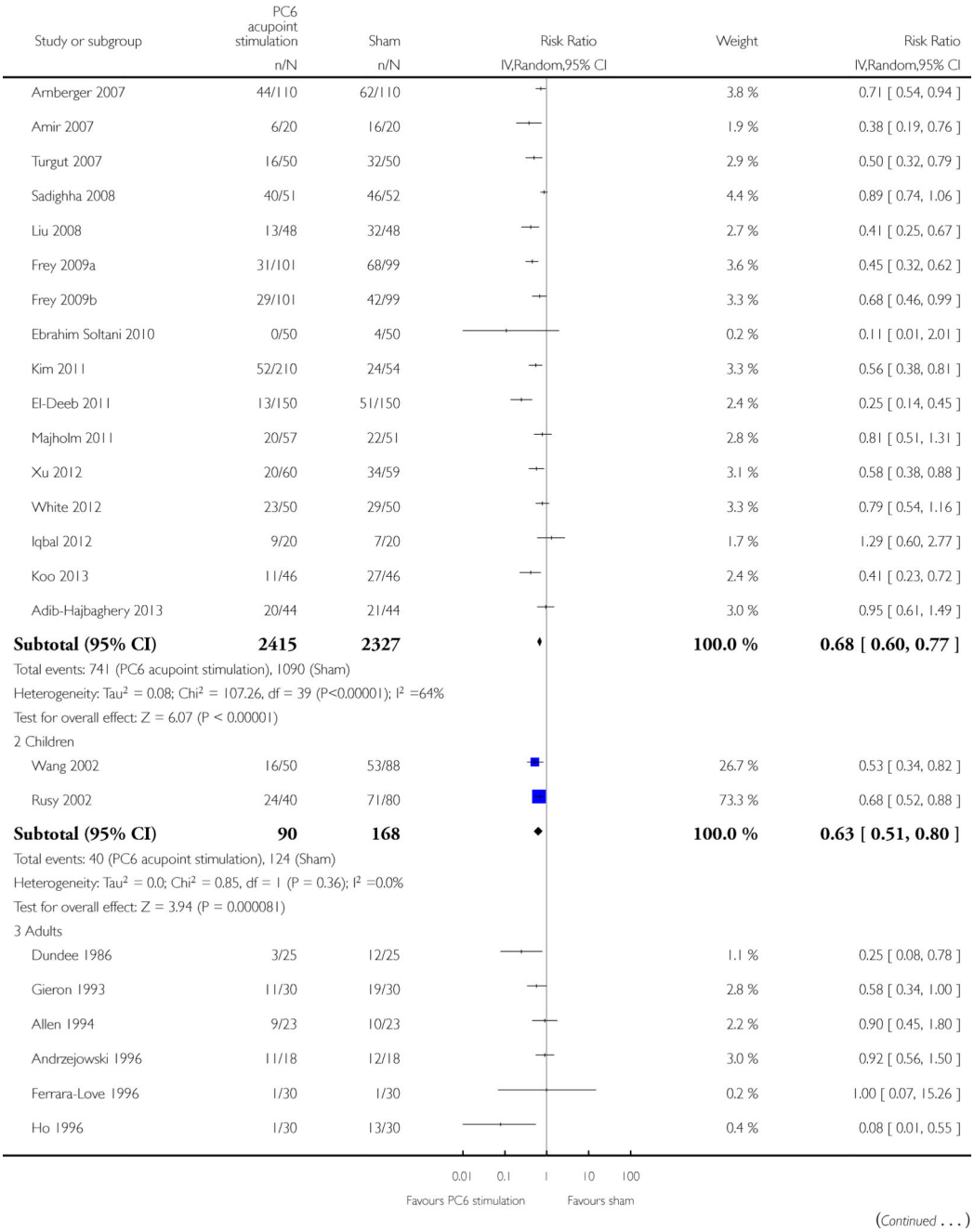

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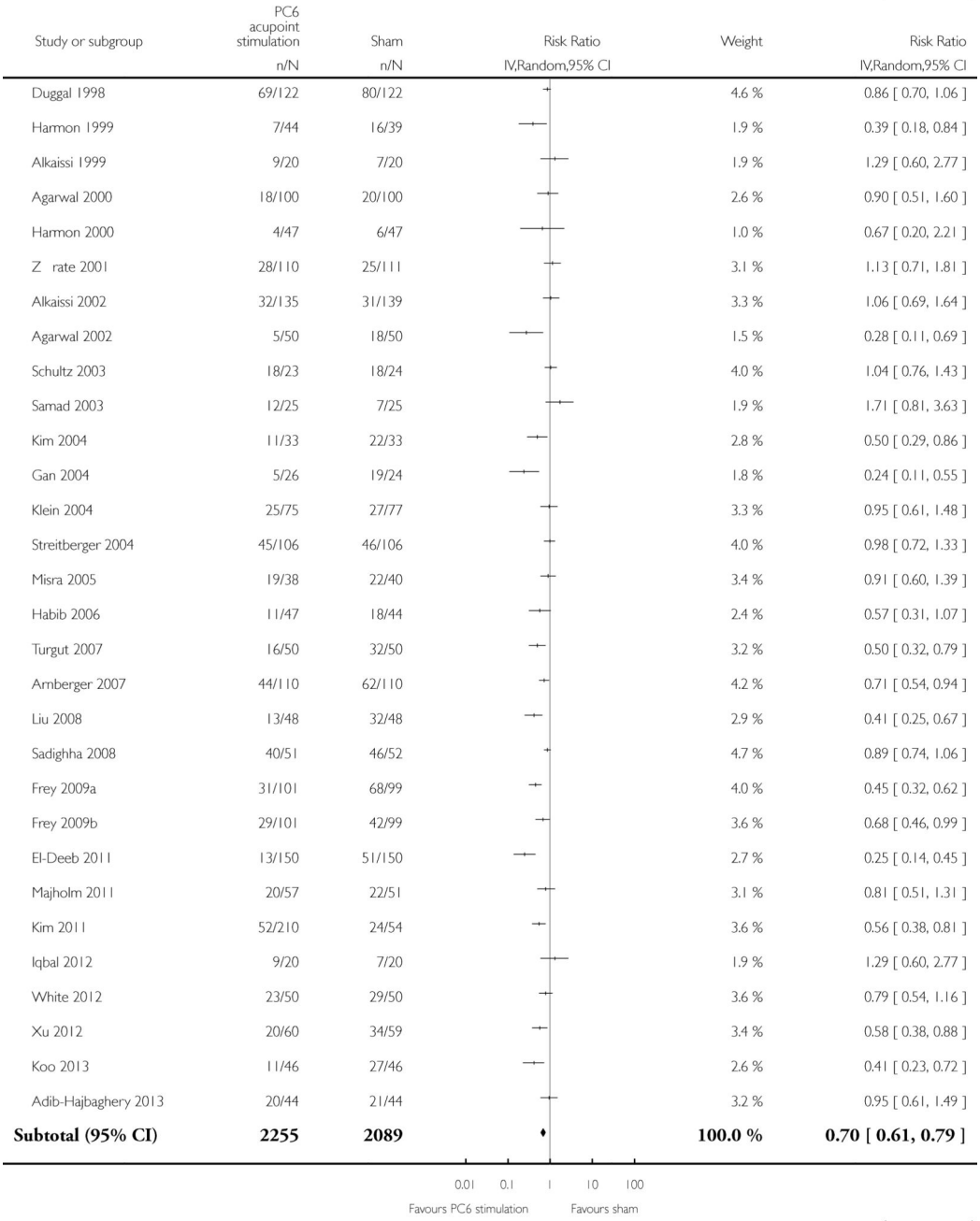

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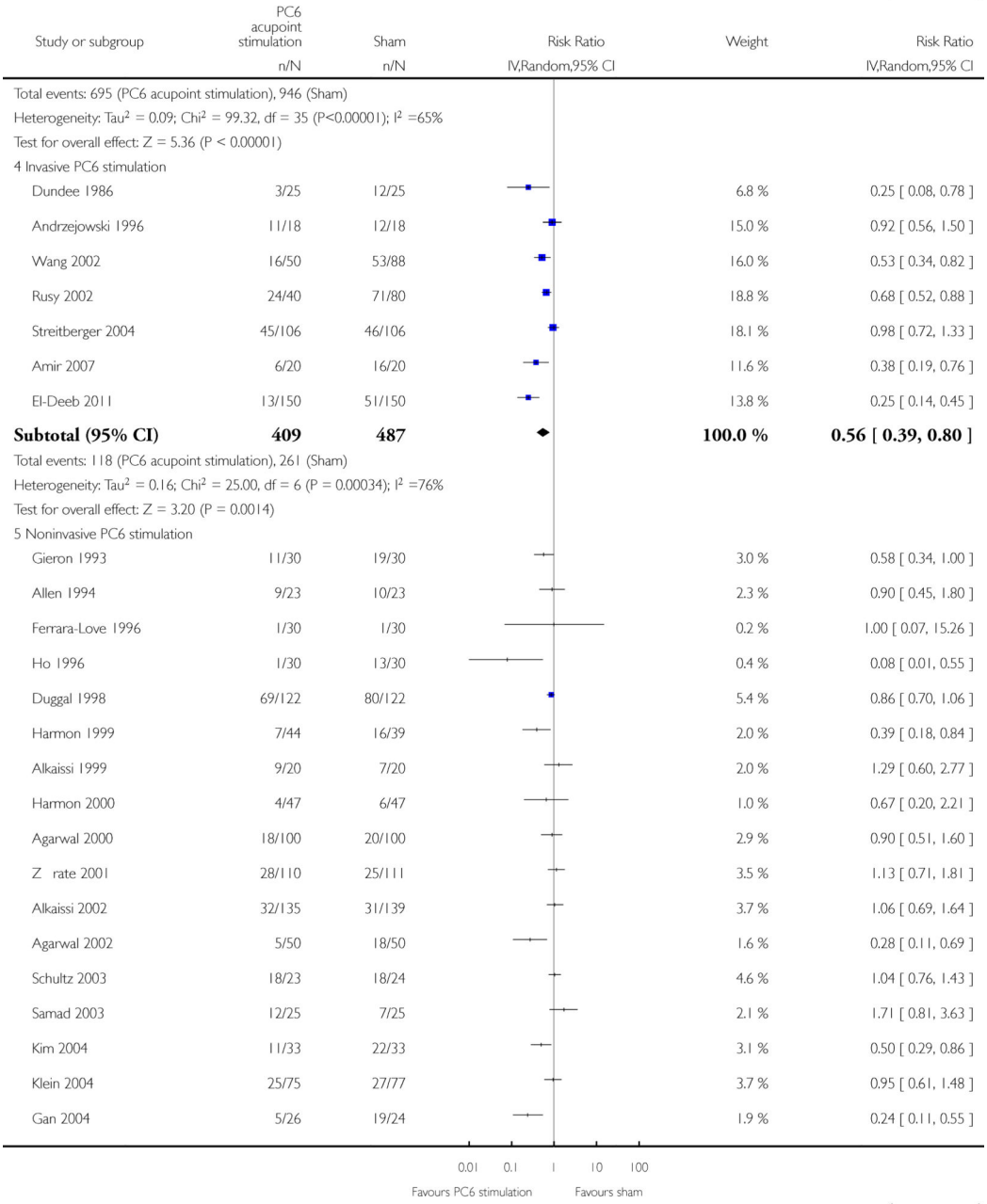

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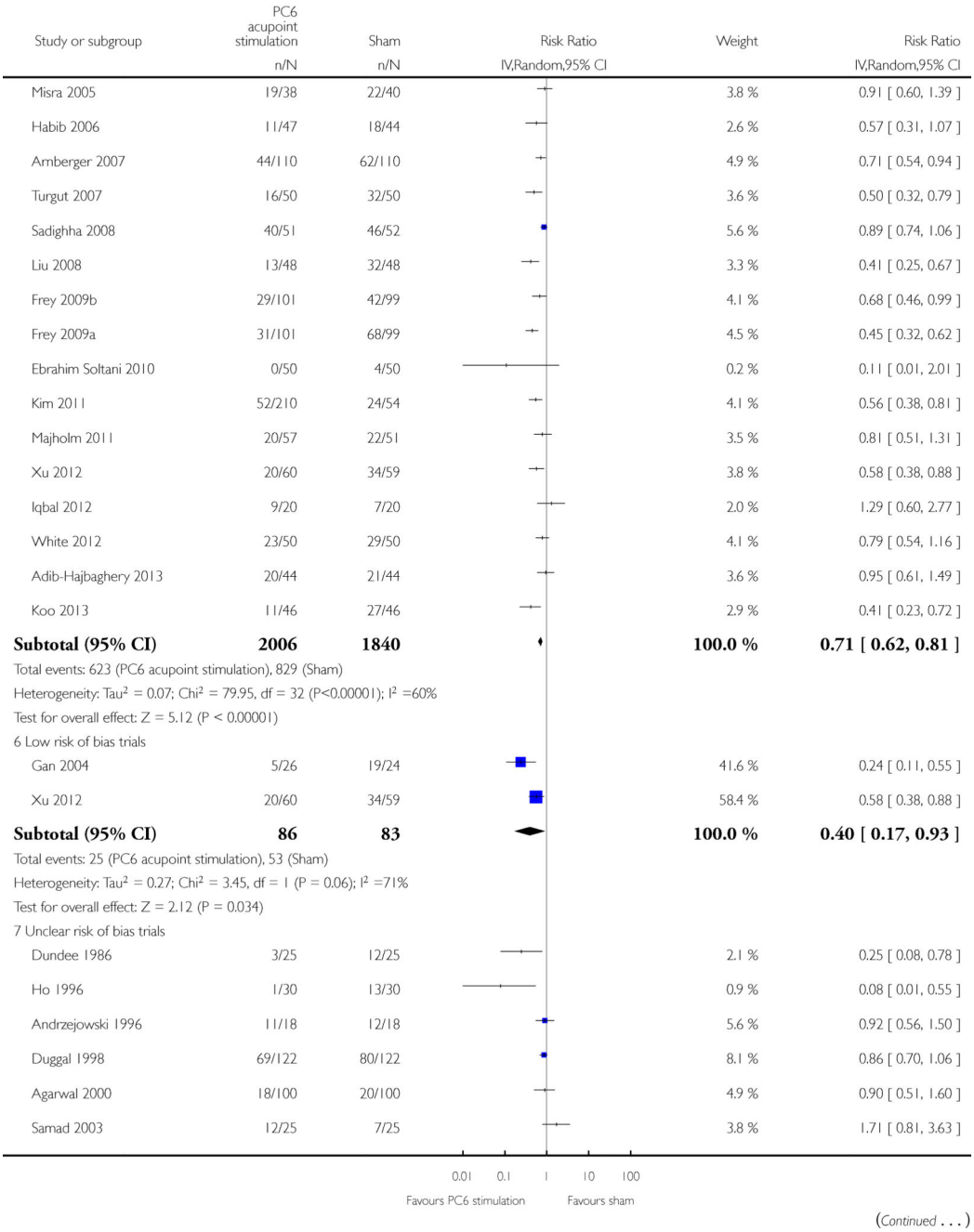

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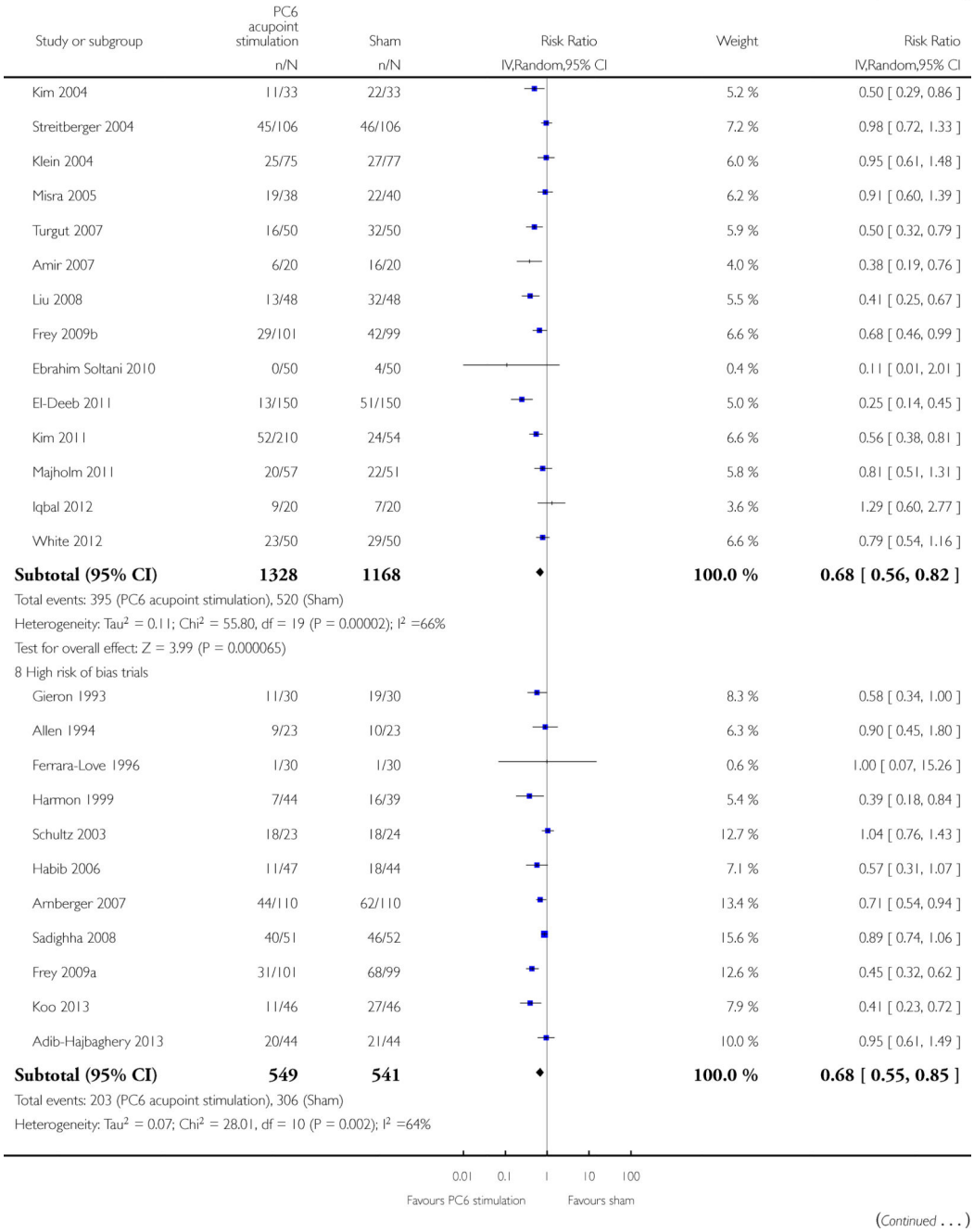

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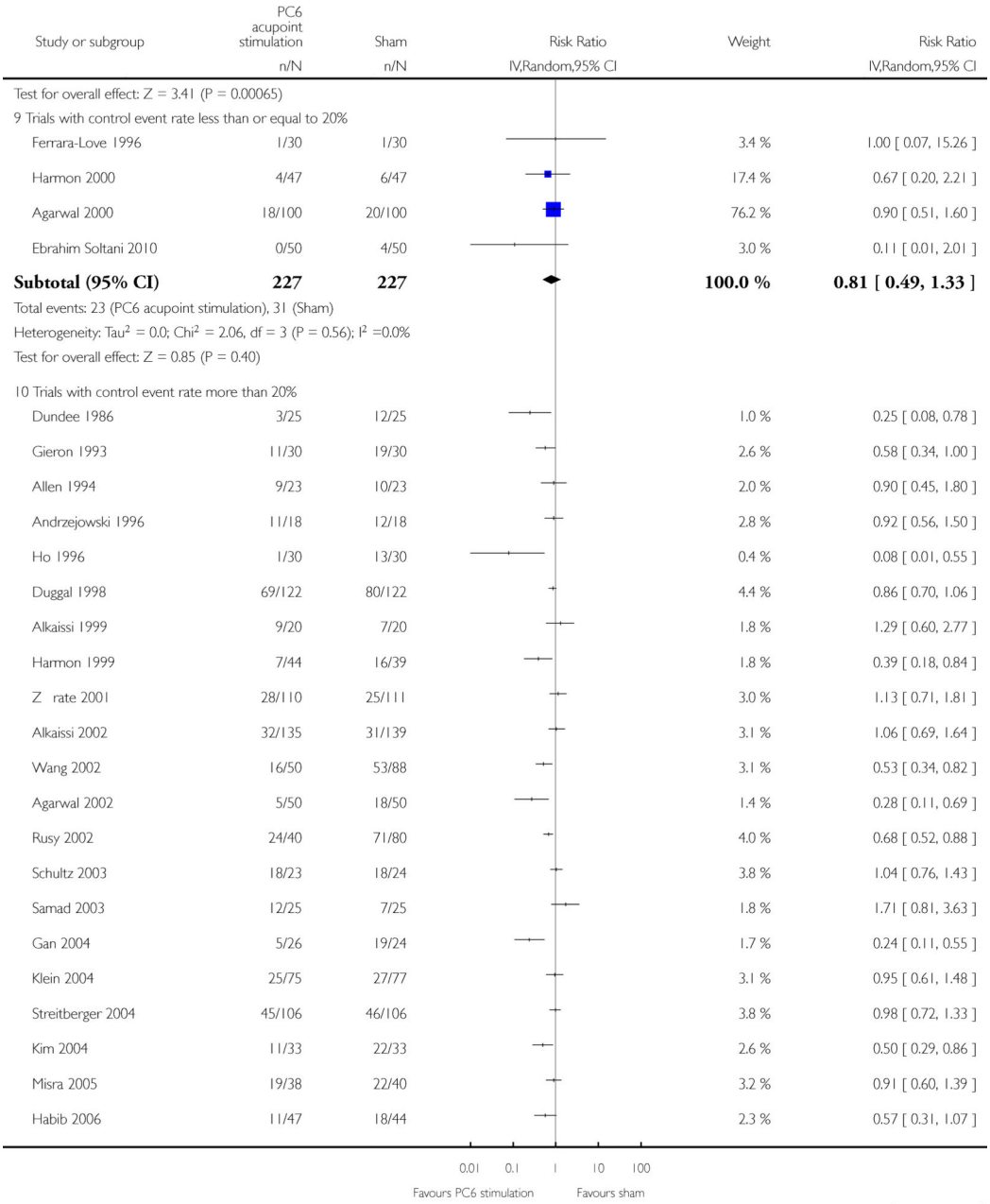

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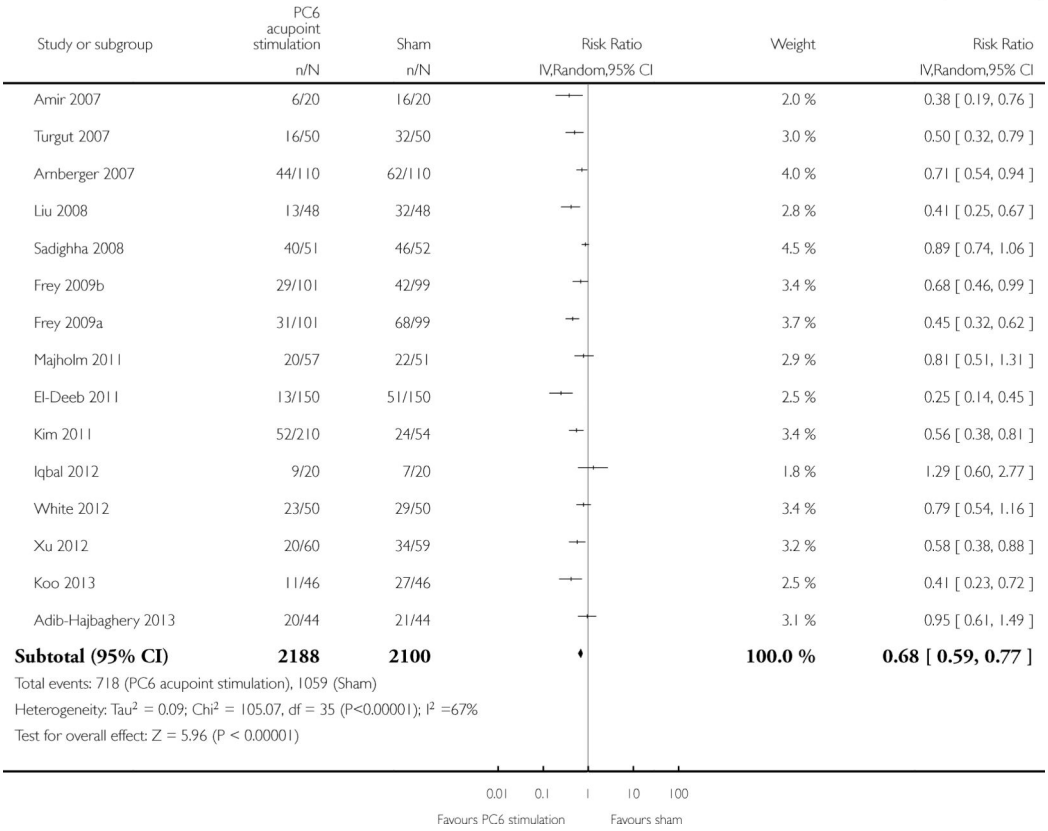
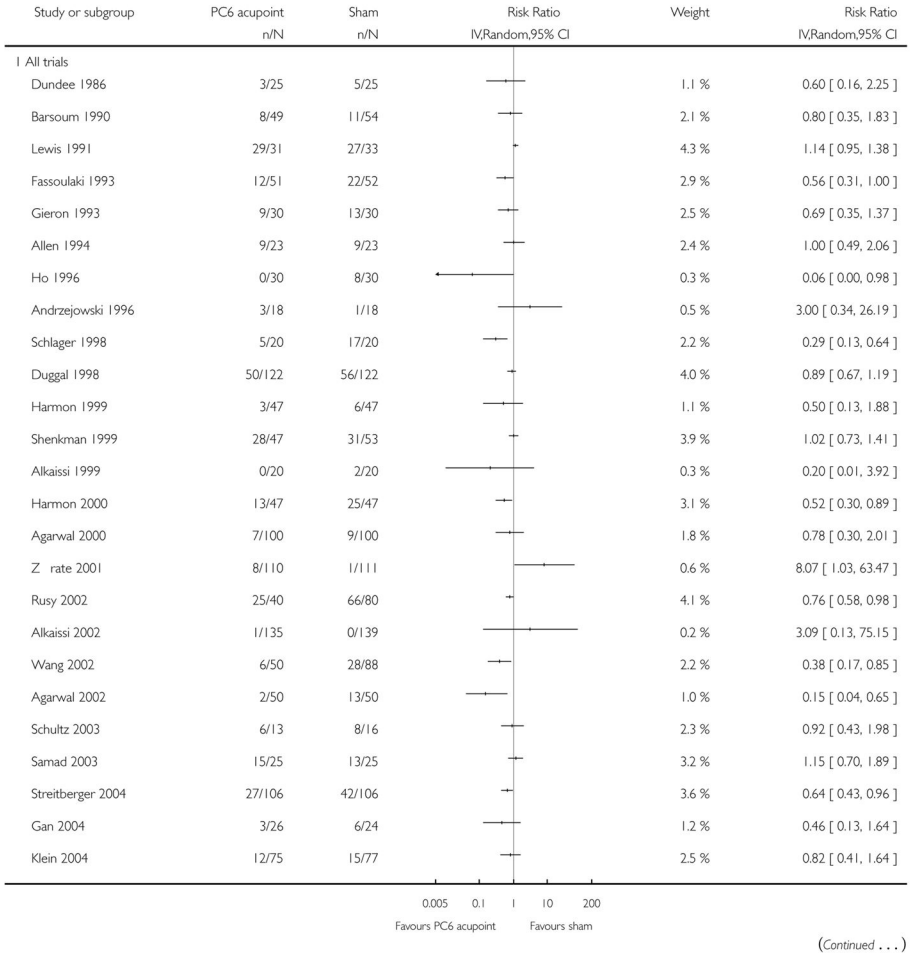


Analysis 1.1.
Comparison 1 Acupoint PC6 stimulation versus sham, Outcome 1 Nausea.

Review: Stimulation of the wrist acupuncture point PC6 for preventing postoperative nausea and vomiting

Comparison: 1 Acupoint PC6 stimulation versus sham

Outcome: 2 Vomiting



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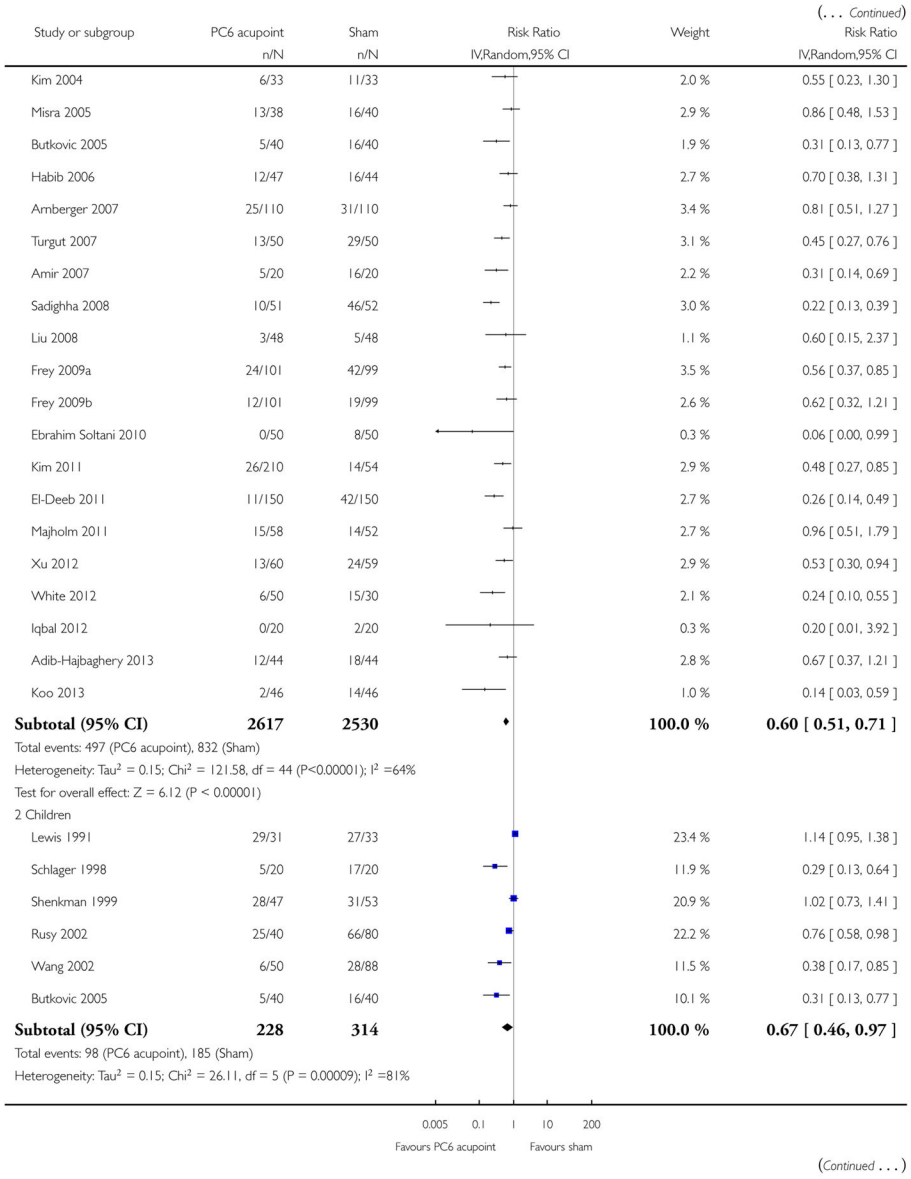

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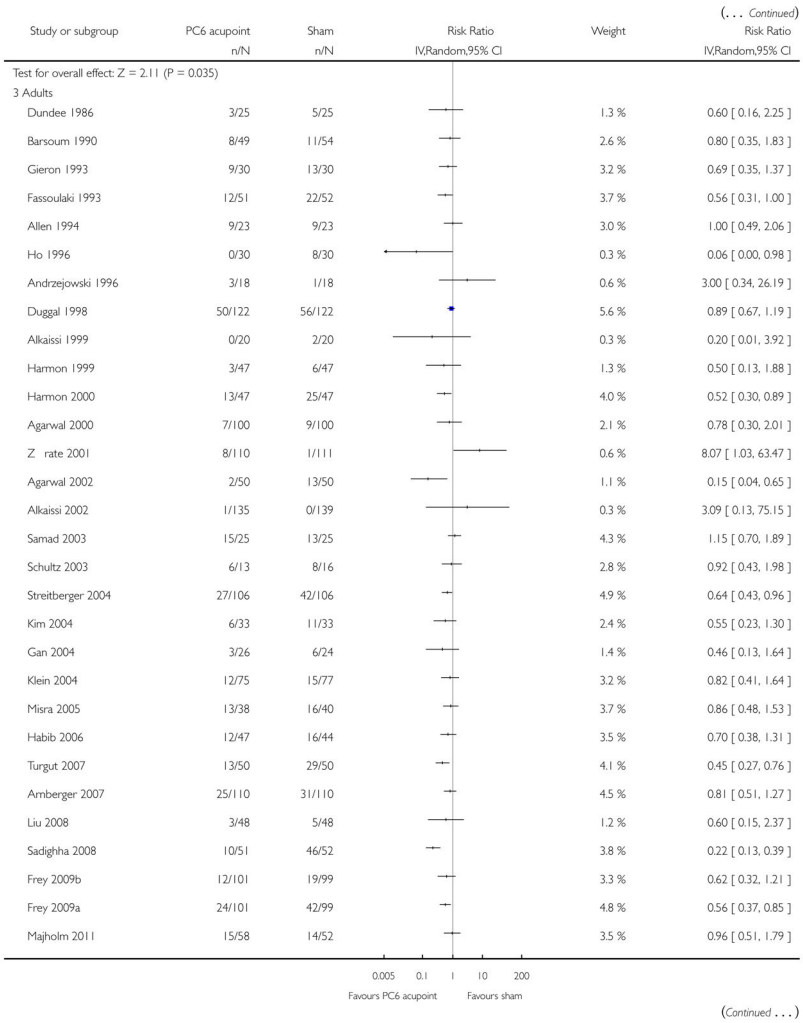

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Study or subgroup	PC6 acupoint n/N	Sham n/N	Risk Ratio IV,Random,95% CI	Weight	Risk Ratio IV,Random,95% CI
Kim 2011	26/210	14/54		3.8 %	0.48 [0.27, 0.85]
El-Deeb 2011	11/150	42/150		3.5 %	0.26 [0.14, 0.49]
Xu 2012	13/60	24/59		3.8 %	0.53 [0.30, 0.94]
Iqbal 2012	0/20	2/20		0.3 %	0.20 [0.01, 3.92]
White 2012	6/50	15/30		2.5 %	0.24 [0.10, 0.55]
Koo 2013	2/46	14/46		1.2 %	0.14 [0.03, 0.59]
Adib-Hajbaghery 2013	12/44	18/44		3.6 %	0.67 [0.37, 1.21]
Subtotal (95% CI)	**2319**	**2146**		**100.0 %**	**0.61 [0.51, 0.72]**
Total events: 394 (PC6 acupoint), 623 (Sham)					
Heterogeneity: $Tau^2 = 0.11$; $Chi^2 = 69.99$, df = 36 (P = 0.00059); $I^2 = 49\%$					
Test for overall effect: Z = 5.85 (P < 0.00001)					
4 Invasive PC6 stimulation					
Dundee 1986	3/25	5/25		6.9 %	0.60 [0.16, 2.25]
Andrzejowski 1996	3/18	1/18		3.0 %	3.00 [0.34, 26.19]
Rusy 2002	25/40	66/80		25.1 %	0.76 [0.58, 0.98]
Wang 2002	6/50	28/88		13.0 %	0.38 [0.17, 0.85]
Streitberger 2004	27/106	42/106		21.9 %	0.64 [0.43, 0.96]
Amir 2007	5/20	16/20		13.4 %	0.31 [0.14, 0.69]
El-Deeb 2011	11/150	42/150		16.7 %	0.26 [0.14, 0.49]
Subtotal (95% CI)	**409**	**487**		**100.0 %**	**0.51 [0.34, 0.76]**
Total events: 80 (PC6 acupoint), 200 (Sham)					
Heterogeneity: $Tau^2 = 0.15$; $Chi^2 = 15.96$, df = 6 (P = 0.01); $I^2 = 62\%$					
Test for overall effect: Z = 3.32 (P = 0.00091)					
5 Noninvasive PC6 stimulation					
Barsoum 1990	8/49	11/54		2.7 %	0.80 [0.35, 1.83]
Lewis 1991	29/31	27/33		5.3 %	1.14 [0.95, 1.38]
Gieron 1993	9/30	13/30		3.2 %	0.69 [0.35, 1.37]
Fassoulaki 1993	12/51	22/52		3.6 %	0.56 [0.31, 1.00]
Allen 1994	9/23	9/23		3.1 %	1.00 [0.49, 2.06]
Ho 1996	0/30	8/30		0.4 %	0.06 [0.00, 0.98]
Schlager 1998	5/20	17/20		2.8 %	0.29 [0.13, 0.64]
Duggal 1998	50/122	56/122		4.9 %	0.89 [0.67, 1.19]
Harmon 1999	3/47	6/47		1.5 %	0.50 [0.13, 1.88]
Alkaissi 1999	0/20	2/20		0.4 %	0.20 [0.01, 3.92]

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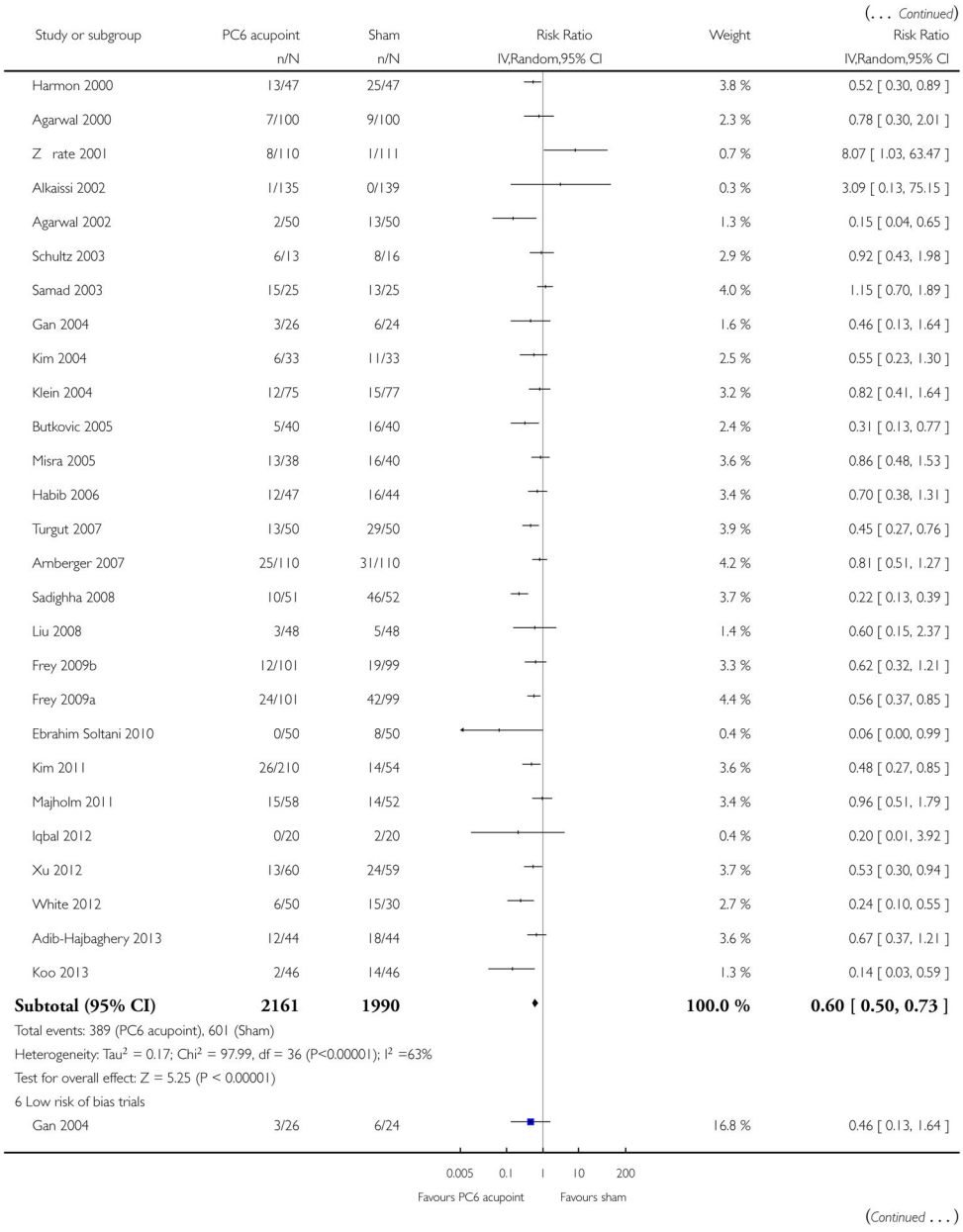

Study or subgroup	PC6 acupoint n/N	Sham n/N	Risk Ratio IV,Random,95% CI	Weight	Risk Ratio IV,Random,95% CI
Harmon 2000	13/47	25/47		3.8 %	0.52 [0.30, 0.89]
Agarwal 2000	7/100	9/100		2.3 %	0.78 [0.30, 2.01]
Z rate 2001	8/110	1/111		0.7 %	8.07 [1.03, 63.47]
Alkaissi 2002	1/135	0/139		0.3 %	3.09 [0.13, 75.15]
Agarwal 2002	2/50	13/50		1.3 %	0.15 [0.04, 0.65]
Schultz 2003	6/13	8/16		2.9 %	0.92 [0.43, 1.98]
Samad 2003	15/25	13/25		4.0 %	1.15 [0.70, 1.89]
Gan 2004	3/26	6/24		1.6 %	0.46 [0.13, 1.64]
Kim 2004	6/33	11/33		2.5 %	0.55 [0.23, 1.30]
Klein 2004	12/75	15/77		3.2 %	0.82 [0.41, 1.64]
Butkovic 2005	5/40	16/40		2.4 %	0.31 [0.13, 0.77]
Misra 2005	13/38	16/40		3.6 %	0.86 [0.48, 1.53]
Habib 2006	12/47	16/44		3.4 %	0.70 [0.38, 1.31]
Turgut 2007	13/50	29/50		3.9 %	0.45 [0.27, 0.76]
Arnberger 2007	25/110	31/110		4.2 %	0.81 [0.51, 1.27]
Sadighha 2008	10/51	46/52		3.7 %	0.22 [0.13, 0.39]
Liu 2008	3/48	5/48		1.4 %	0.60 [0.15, 2.37]
Frey 2009b	12/101	19/99		3.3 %	0.62 [0.32, 1.21]
Frey 2009a	24/101	42/99		4.4 %	0.56 [0.37, 0.85]
Ebrahim Soltani 2010	0/50	8/50		0.4 %	0.06 [0.00, 0.99]
Kim 2011	26/210	14/54		3.6 %	0.48 [0.27, 0.85]
Majholm 2011	15/58	14/52		3.4 %	0.96 [0.51, 1.79]
Iqbal 2012	0/20	2/20		0.4 %	0.20 [0.01, 3.92]
Xu 2012	13/60	24/59		3.7 %	0.53 [0.30, 0.94]
White 2012	6/50	15/30		2.7 %	0.24 [0.10, 0.55]
Adib-Hajbaghery 2013	12/44	18/44		3.6 %	0.67 [0.37, 1.21]
Koo 2013	2/46	14/46		1.3 %	0.14 [0.03, 0.59]
Subtotal (95% CI)	**2161**	**1990**		**100.0 %**	**0.60 [0.50, 0.73]**
Total events: 389 (PC6 acupoint), 601 (Sham)					
Heterogeneity: $Tau^2 = 0.17$; $Chi^2 = 97.99$, df = 36 (P<0.00001); $I^2 = 63\%$					
Test for overall effect: Z = 5.25 (P < 0.00001)					
6 Low risk of bias trials					
Gan 2004	3/26	6/24		16.8 %	0.46 [0.13, 1.64]

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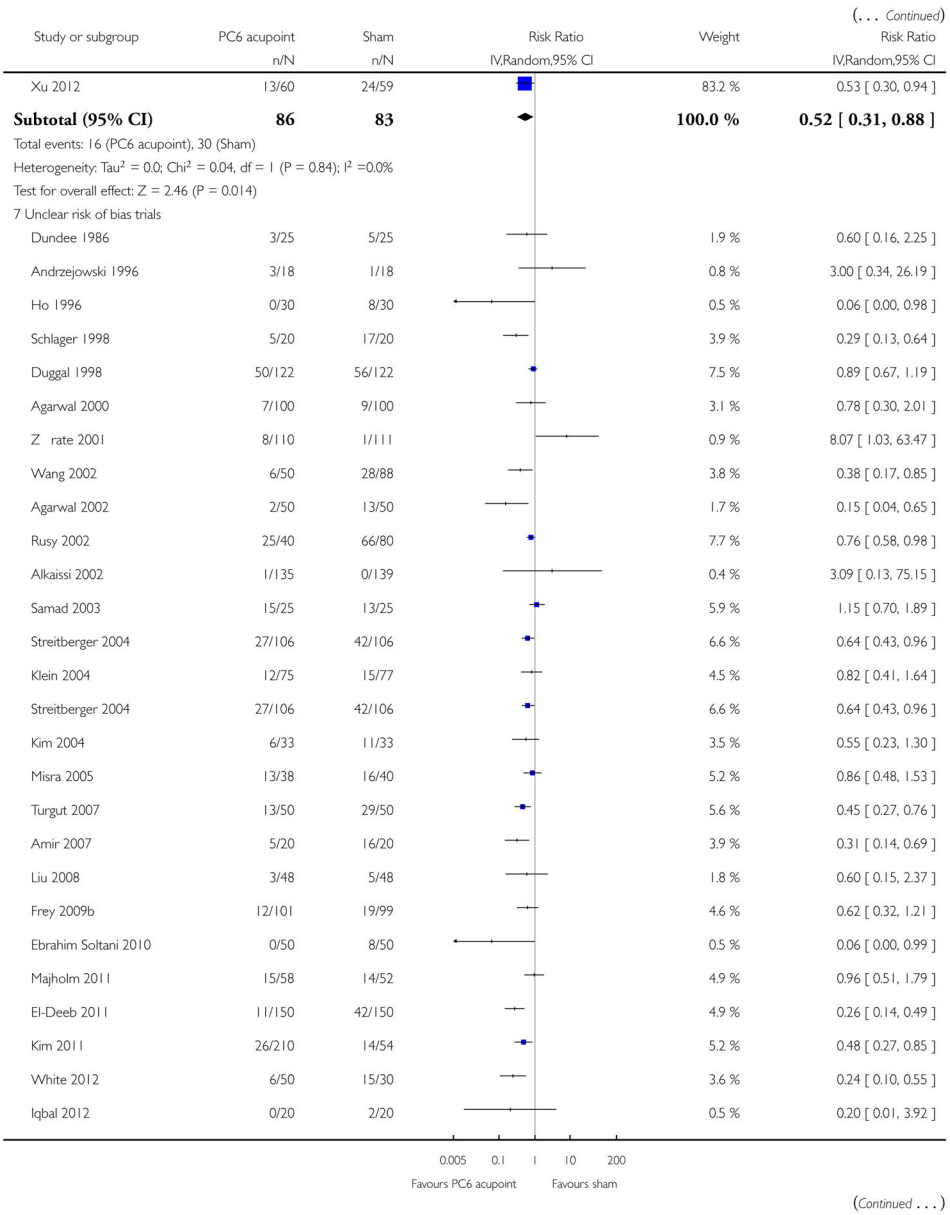

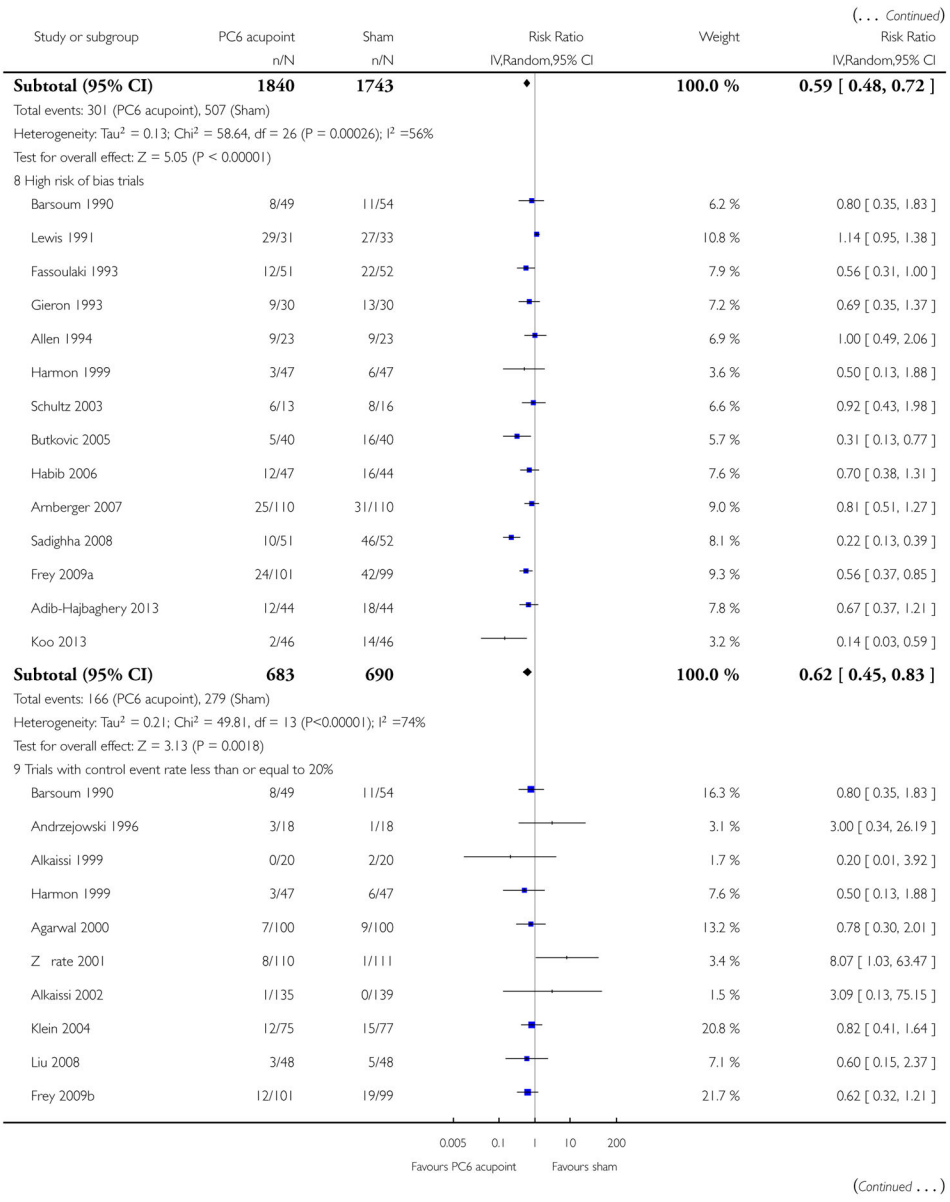

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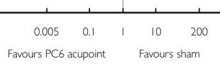
Study or subgroup	PC6 acupoint n/N	Sham n/N	Risk Ratio IV,Random,95% CI	Weight	Risk Ratio IV,Random,95% CI
Ebrahim Soltani 2010	0/50	8/50		1.9 %	0.06 [0.00, 0.99]
Iqbal 2012	0/20	2/20		1.7 %	0.20 [0.01, 3.92]
Subtotal (95% CI)	**773**	**783**		**100.0 %**	**0.75 [0.51, 1.11]**
Total events: 57 (PC6 acupoint), 79 (Sham)					
Heterogeneity: $Tau^2 = 0.07$; $Chi^2 = 12.94$, df = 11 (P = 0.30); $I^2 = 15\%$					
Test for overall effect: Z = 1.45 (P = 0.15)					
10 Trials with control event rate more than 20%					
Dundee 1986	3/25	5/25		1.4 %	0.60 [0.16, 2.25]
Lewis 1991	29/31	27/33		4.9 %	1.14 [0.95, 1.38]
Fassoulaki 1993	12/51	22/52		3.3 %	0.56 [0.31, 1.00]
Gieron 1993	9/30	13/30		3.0 %	0.69 [0.35, 1.37]
Allen 1994	9/23	9/23		2.8 %	1.00 [0.49, 2.06]
Ho 1996	0/30	8/30		0.4 %	0.06 [0.00, 0.98]
Schlager 1998	5/20	17/20		2.6 %	0.29 [0.13, 0.64]
Duggal 1998	50/122	56/122		4.6 %	0.89 [0.67, 1.19]
Shenkman 1999	28/47	31/53		4.4 %	1.02 [0.73, 1.41]
Harmon 2000	13/47	25/47		3.6 %	0.52 [0.30, 0.89]
Agarwal 2002	2/50	13/50		1.2 %	0.15 [0.04, 0.65]
Rusy 2002	25/40	66/80		4.7 %	0.76 [0.58, 0.98]
Wang 2002	6/50	28/88		2.5 %	0.38 [0.17, 0.85]
Samad 2003	15/25	13/25		3.7 %	1.15 [0.70, 1.89]
Schultz 2003	6/13	8/16		2.7 %	0.92 [0.43, 1.98]
Streitberger 2004	27/106	42/106		4.1 %	0.64 [0.43, 0.96]
Kim 2004	6/33	11/33		2.3 %	0.55 [0.23, 1.30]
Gan 2004	3/26	6/24		1.4 %	0.46 [0.13, 1.64]
Butkovic 2005	5/40	16/40		2.2 %	0.31 [0.13, 0.77]
Misra 2005	13/38	16/40		3.4 %	0.86 [0.48, 1.53]
Habib 2006	12/47	16/44		3.2 %	0.70 [0.38, 1.31]
Amir 2007	5/20	16/20		2.6 %	0.31 [0.14, 0.69]
Turgut 2007	13/50	29/50		3.6 %	0.45 [0.27, 0.76]
Amberger 2007	25/110	31/110		3.9 %	0.81 [0.51, 1.27]
Sadighha 2008	10/51	46/52		3.4 %	0.22 [0.13, 0.39]
Frey 2009a	24/101	42/99		4.0 %	0.56 [0.37, 0.85]



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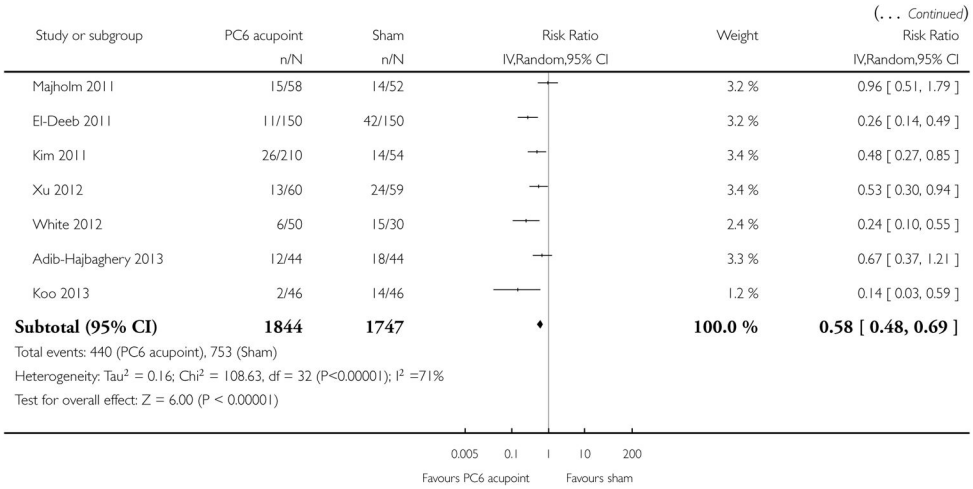
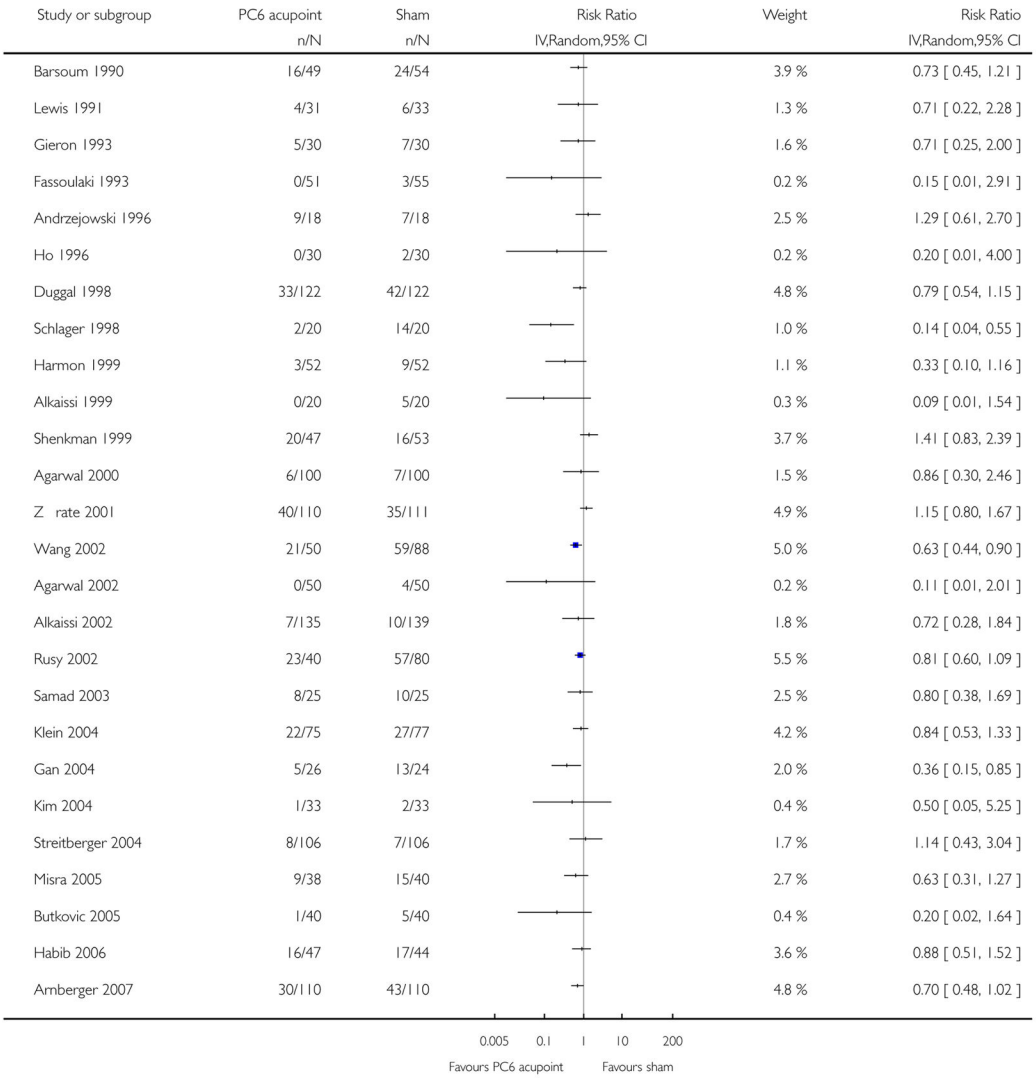


Analysis 1.2.
Comparison 1 Acupoint PC6 stimulation versus sham, Outcome 2 Vomiting.

Review: Stimulation of the wrist acupuncture point PC6 for preventing postoperative nausea and vomiting

Comparison: 1 Acupoint PC6 stimulation versus sham

Outcome: 3 Rescue antiemetics



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Study or subgroup	PC6 acupoint n/N	Sham n/N	Risk Ratio IV,Random,95% CI	Weight	Risk Ratio IV,Random,95% CI
Turgut 2007	13/50	33/50		3.8 %	0.39 [0.24, 0.65]
Amir 2007	6/20	16/20		2.7 %	0.38 [0.19, 0.76]
Liu 2008	9/48	18/48		2.7 %	0.50 [0.25, 1.00]
Frey 2009a	41/101	64/99		5.7 %	0.63 [0.48, 0.83]
El-Deeb 2011	13/150	51/150		3.4 %	0.25 [0.14, 0.45]
Majholm 2011	16/59	16/53		3.3 %	0.90 [0.50, 1.61]
Kim 2011	33/210	15/54		3.7 %	0.57 [0.33, 0.96]
Xu 2012	11/60	18/59		2.9 %	0.60 [0.31, 1.16]
White 2012	14/50	23/50		3.6 %	0.61 [0.36, 1.04]
Iqbal 2012	0/20	5/20		0.3 %	0.09 [0.01, 1.54]
Koo 2013	3/46	14/46		1.3 %	0.21 [0.07, 0.70]
Adib-Hajbaghery 2013	5/44	12/44		1.7 %	0.42 [0.16, 1.08]
Ertas 2015	8/31	18/31		2.9 %	0.44 [0.23, 0.87]
Total (95% CI)	**2344**	**2278**		**100.0 %**	**0.64 [0.55, 0.73]**

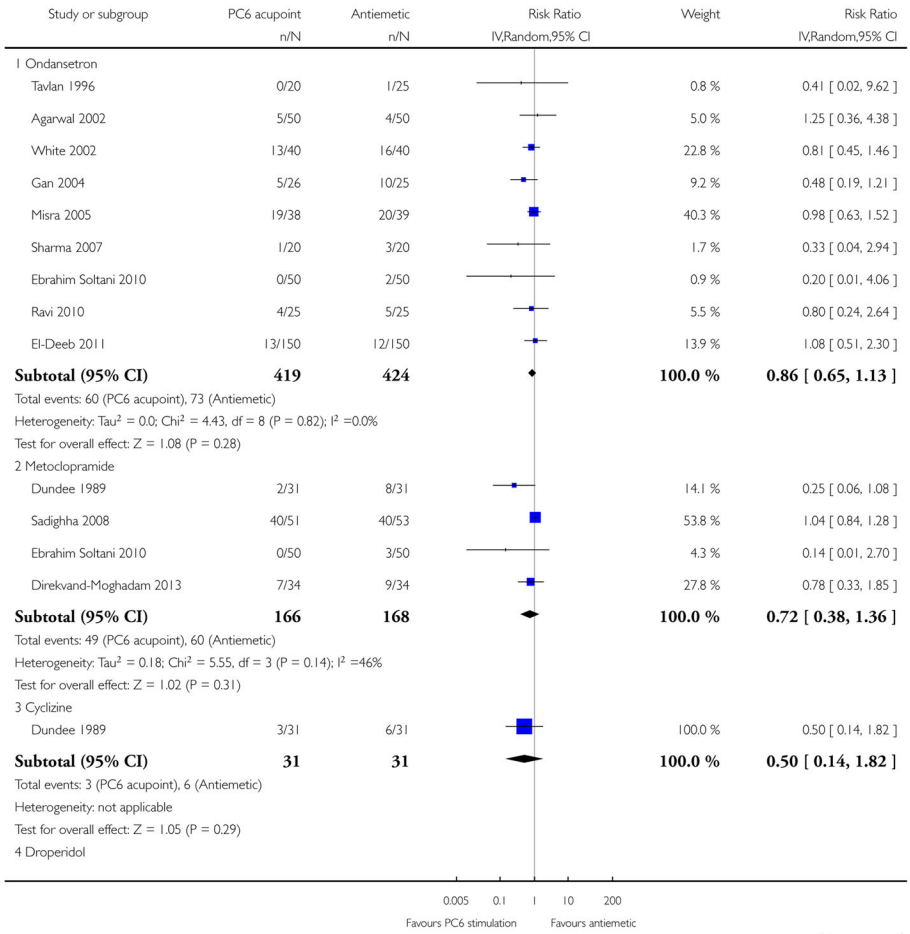
Total events: 461 (PC6 acupoint), 749 (Sham)
Heterogeneity: $Tau^2 = 0.07$; $Chi^2 = 67.91$, df = 38 (P = 0.002); $I^2 = 44\%$
Test for overall effect: Z = 6.14 (P < 0.00001)
Test for subgroup differences: Not applicable

Analysis 1.3.
Comparison 1 Acupoint PC6 stimulation versus sham, Outcome 3 Rescue antiemetics.

Review: Stimulation of the wrist acupuncture point PC6 for preventing postoperative nausea and vomiting

Comparison: 2 Acupoint PC6 stimulation versus antiemetic drug

Outcome: 1 Nausea



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Study or subgroup	PC6 acupoint n/N	Antiemetic n/N	Risk Ratio IV,Random,95% CI	Weight	Risk Ratio IV,Random,95% CI
Wang 2002	16/50	23/49		49.2 %	0.68 [0.41, 1.13]
Schultz 2003	18/23	11/21		50.8 %	1.49 [0.94, 2.37]
Subtotal (95% CI)	**73**	**70**		**100.0 %**	**1.02 [0.47, 2.19]**
Total events: 34 (PC6 acupoint), 34 (Antiemetic)					
Heterogeneity: $Tau^2 = 0.25$; $Chi^2 = 5.09$, df = 1 (P = 0.02); $I^2 = 80\%$					
Test for overall effect: Z = 0.04 (P = 0.97)					
5 All antiemetics combined					
Dundee 1989	5/62	14/62		3.6 %	0.36 [0.14, 0.93]
Tavlan 1996	0/20	1/25		0.4 %	0.41 [0.02, 9.62]
Wang 2002	16/50	23/49		11.1 %	0.68 [0.41, 1.13]
White 2002	13/40	16/40		8.6 %	0.81 [0.45, 1.46]
Agarwal 2002	5/50	4/50		2.2 %	1.25 [0.36, 4.38]
Schultz 2003	18/23	11/21		12.6 %	1.49 [0.94, 2.37]
Gan 2004	5/26	10/25		3.9 %	0.48 [0.19, 1.21]
Misra 2005	19/38	20/39		13.4 %	0.98 [0.63, 1.52]
Sharma 2007	1/20	3/20		0.7 %	0.33 [0.04, 2.94]
Sadighha 2008	40/51	40/53		30.5 %	1.04 [0.84, 1.28]
Ravi 2010	4/25	5/25		2.4 %	0.80 [0.24, 2.64]
Ebrahim Soltani 2010	0/50	5/100		0.4 %	0.18 [0.01, 3.19]
El-Deeb 2011	13/150	12/150		5.7 %	1.08 [0.51, 2.30]
Direkvand-Moghadam 2013	7/34	9/34		4.4 %	0.78 [0.33, 1.85]
Subtotal (95% CI)	**639**	**693**		**100.0 %**	**0.91 [0.75, 1.10]**
Total events: 146 (PC6 acupoint), 173 (Antiemetic)					
Heterogeneity: $Tau^2 = 0.02$; $Chi^2 = 15.49$, df = 13 (P = 0.28); $I^2 = 16\%$					
Test for overall effect: Z = 0.96 (P = 0.34)					
6 Children					
Wang 2002	16/50	23/49		100.0 %	0.68 [0.41, 1.13]
Subtotal (95% CI)	**50**	**49**		**100.0 %**	**0.68 [0.41, 1.13]**
Total events: 16 (PC6 acupoint), 23 (Antiemetic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.50 (P = 0.13)					
7 Adult					
Dundee 1989	5/62	14/62		4.3 %	0.36 [0.14, 0.93]
Tavlan 1996	0/20	1/25		0.4 %	0.41 [0.02, 9.62]
Agarwal 2002	5/50	4/50		2.6 %	1.25 [0.36, 4.38]
White 2002	13/40	16/40		10.1 %	0.81 [0.45, 1.46]

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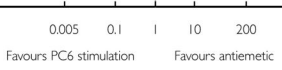
Study or subgroup	PC6 acupoint n/N	Antiemetic n/N	Risk Ratio IV,Random,95% CI	Weight	Risk Ratio IV,Random,95% CI
Schultz 2003	18/23	11/21		14.7 %	1.49 [0.94, 2.37]
Gan 2004	5/26	10/25		4.6 %	0.48 [0.19, 1.21]
Misra 2005	19/38	20/39		15.7 %	0.98 [0.63, 1.52]
Sharma 2007	1/20	3/20		0.9 %	0.33 [0.04, 2.94]
Sadighha 2008	40/51	40/53		35.0 %	1.04 [0.84, 1.28]
El-Deeb 2011	13/150	12/150		6.6 %	1.08 [0.51, 2.30]
Direkvand-Moghadam 2013	7/34	9/34		5.1 %	0.78 [0.33, 1.85]
Subtotal (95% CI)	**514**	**519**		**100.0 %**	**0.96 [0.78, 1.17]**
Total events: 126 (PC6 acupoint), 140 (Antiemetic)					
Heterogeneity: $Tau^2 = 0.02$; $Chi^2 = 12.15$, df = 10 (P = 0.28); $I^2 = 18\%$					
Test for overall effect: Z = 0.43 (P = 0.67)					
8 Invasive PC6 stimulation					
Dundee 1989	5/62	14/62		28.1 %	0.36 [0.14, 0.93]
Tavlan 1996	0/20	1/25		2.6 %	0.41 [0.02, 9.62]
Sharma 2007	1/20	3/20		5.4 %	0.33 [0.04, 2.94]
Ravi 2010	4/25	5/25		18.2 %	0.80 [0.24, 2.64]
El-Deeb 2011	13/150	12/150		45.7 %	1.08 [0.51, 2.30]
Subtotal (95% CI)	**277**	**282**		**100.0 %**	**0.69 [0.41, 1.14]**
Total events: 23 (PC6 acupoint), 35 (Antiemetic)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 3.79$, df = 4 (P = 0.44); $I^2 = 0.0\%$					
Test for overall effect: Z = 1.45 (P = 0.15)					
9 Noninvasive PC6 stimulation					
Wang 2002	16/50	23/49		12.6 %	0.68 [0.41, 1.13]
Agarwal 2002	5/50	4/50		2.4 %	1.25 [0.36, 4.38]
White 2002	13/40	16/40		9.8 %	0.81 [0.45, 1.46]
Schultz 2003	18/23	11/21		14.3 %	1.49 [0.94, 2.37]
Gan 2004	5/26	10/25		4.4 %	0.48 [0.19, 1.21]
Misra 2005	19/38	20/39		15.3 %	0.98 [0.63, 1.52]
Sadighha 2008	40/51	40/53		35.8 %	1.04 [0.84, 1.28]
Ebrahim Soltani 2010	0/50	5/100		0.5 %	0.18 [0.01, 3.19]
Direkvand-Moghadam 2013	7/34	9/34		4.9 %	0.78 [0.33, 1.85]
Subtotal (95% CI)	**362**	**411**		**100.0 %**	**0.95 [0.78, 1.16]**
Total events: 123 (PC6 acupoint), 138 (Antiemetic)					
Heterogeneity: $Tau^2 = 0.02$; $Chi^2 = 9.95$, df = 8 (P = 0.27); $I^2 = 20\%$					
Test for overall effect: Z = 0.47 (P = 0.64)					



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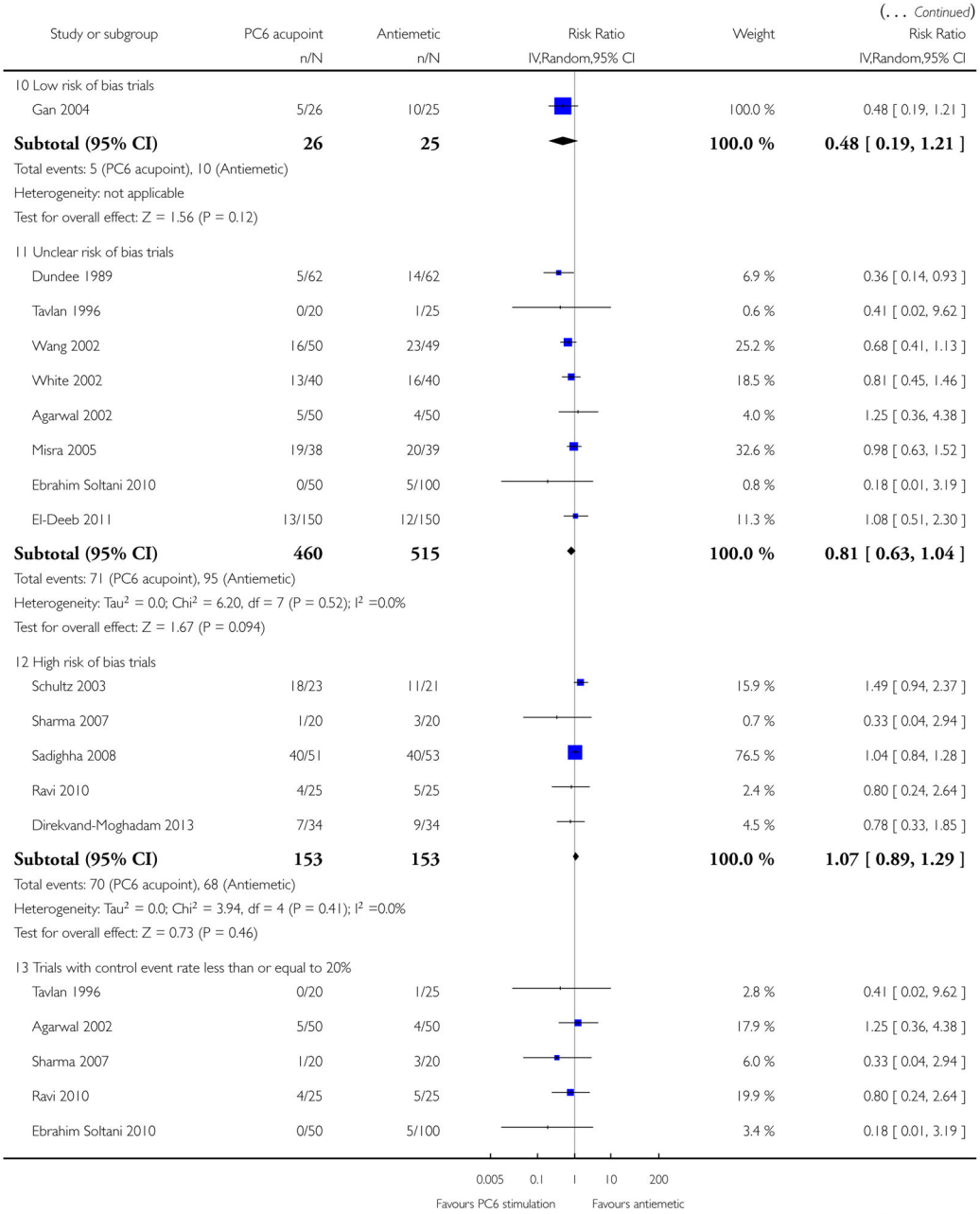
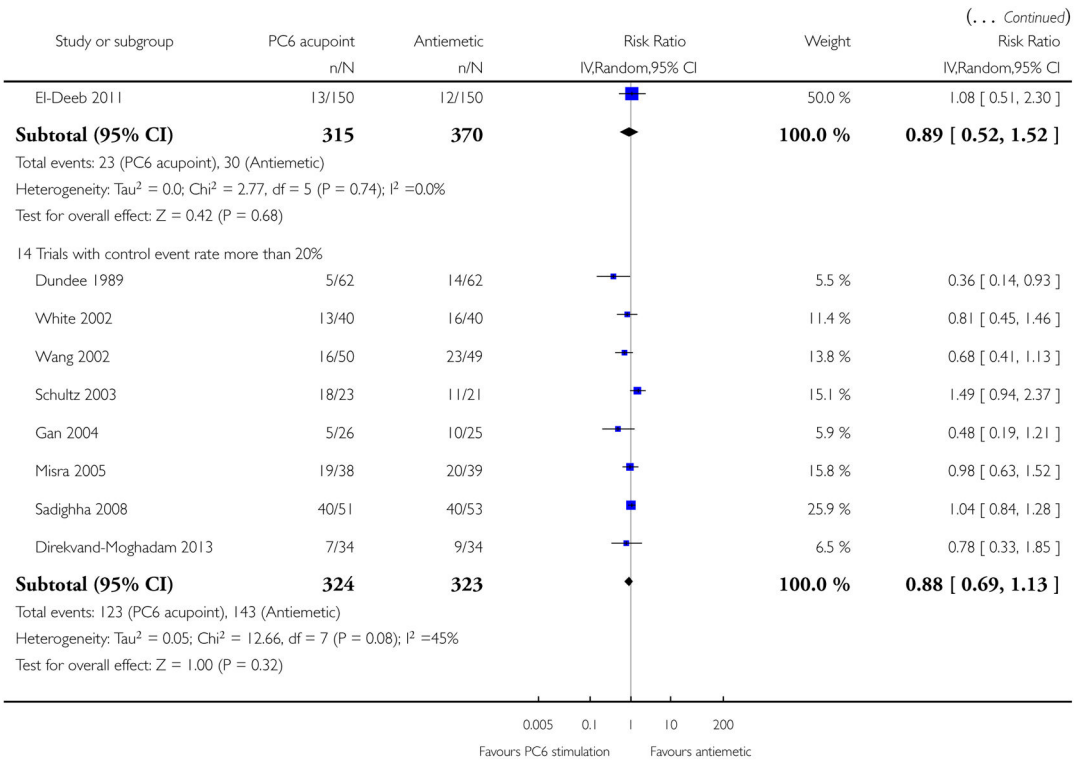


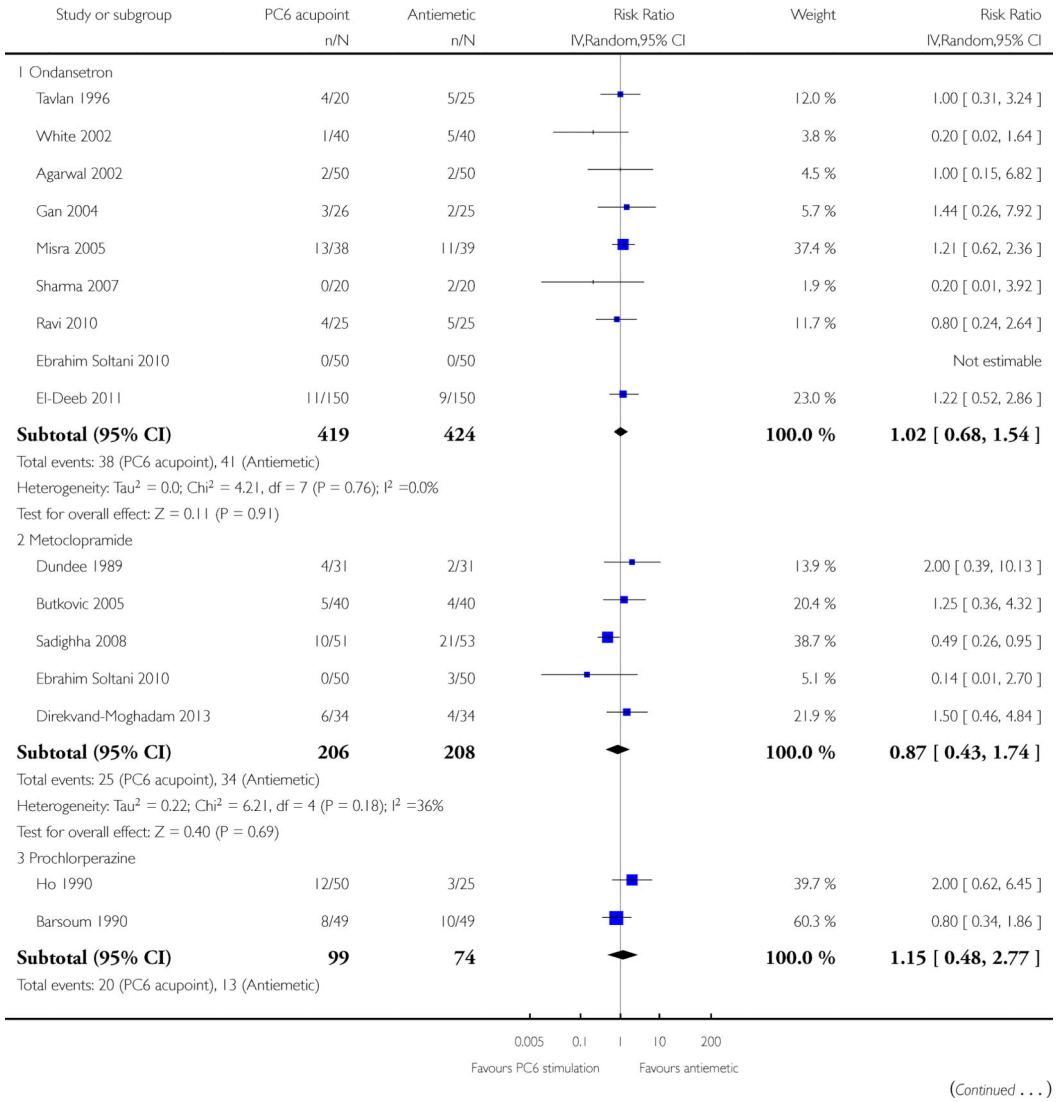


Analysis 2.1.
Comparison 2 Acupoint PC6 stimulation versus antiemetic drug, Outcome 1 Nausea.

Review: Stimulation of the wrist acupuncture point PC6 for preventing postoperative nausea and vomiting

Comparison: 2 Acupoint PC6 stimulation versus antiemetic drug

Outcome: 2 Vomiting



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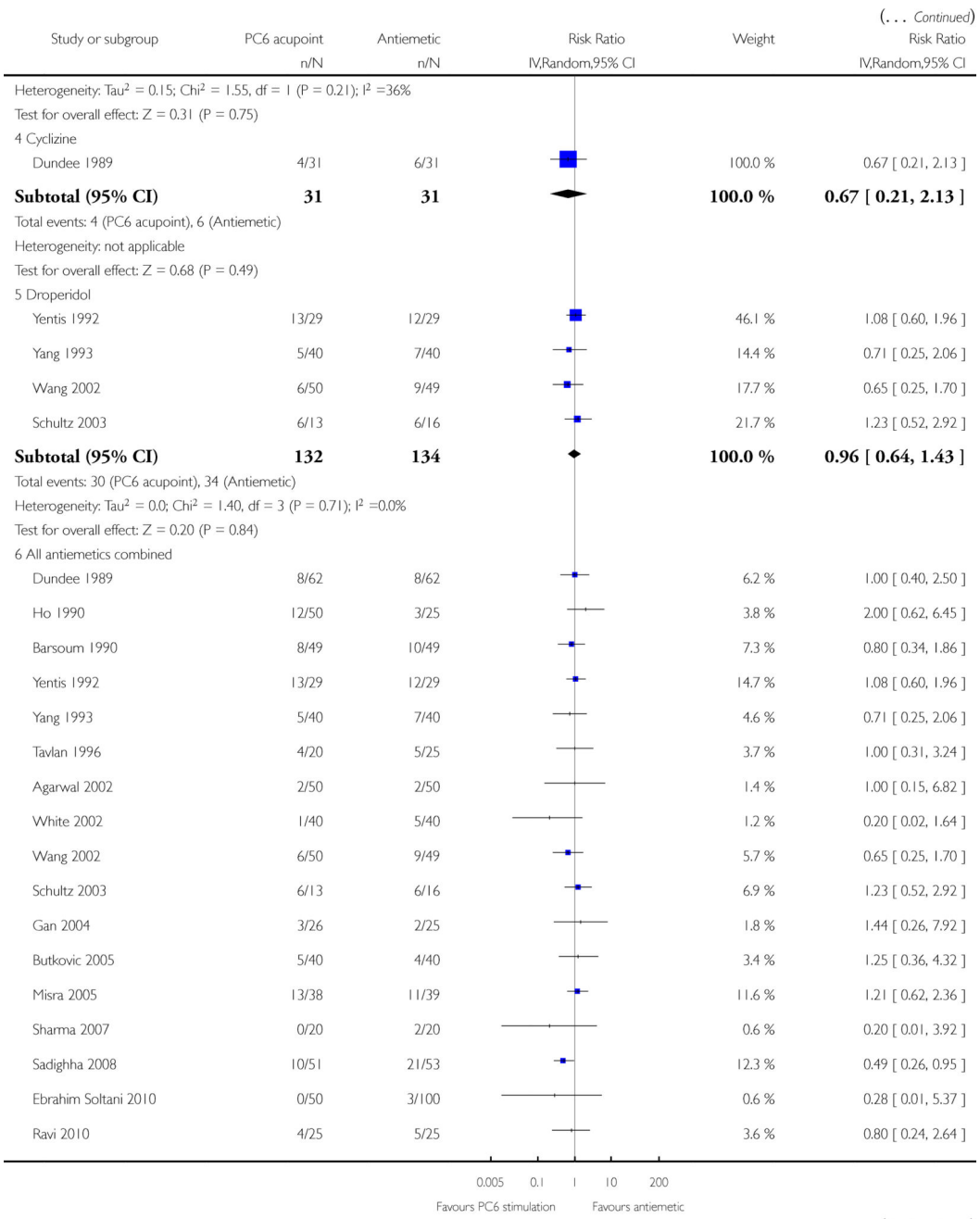

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Study or subgroup	PC6 acupoint n/N	Antiemetic n/N	Risk Ratio IV,Random,95% CI	Weight	Risk Ratio IV,Random,95% CI
El-Deeb 2011	11/150	9/150		7.1 %	1.22 [0.52, 2.86]
Direkvand-Moghadam 2013	6/34	4/34		3.7 %	1.50 [0.46, 4.84]
Subtotal (95% CI)	**837**	**871**		**100.0 %**	**0.93 [0.74, 1.17]**
Total events: 117 (PC6 acupoint), 128 (Antiemetic)					
Heterogeneity: Tau^2 = 0.0; Chi^2 = 12.76, df = 18 (P = 0.81); I^2 =0.0%					
Test for overall effect: Z = 0.59 (P = 0.56)					
7 Children					
Yentis 1992	13/29	12/29		62.0 %	1.08 [0.60, 1.96]
Wang 2002	6/50	9/49		23.8 %	0.65 [0.25, 1.70]
Butkovic 2005	5/40	4/40		14.2 %	1.25 [0.36, 4.32]
Subtotal (95% CI)	**119**	**118**		**100.0 %**	**0.98 [0.61, 1.56]**
Total events: 24 (PC6 acupoint), 25 (Antiemetic)					
Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.95, df = 2 (P = 0.62); I^2 =0.0%					
Test for overall effect: Z = 0.09 (P = 0.93)					
8 Adult					
Dundee 1989	8/62	8/62		8.5 %	1.00 [0.40, 2.50]
Ho 1990	12/50	3/25		5.2 %	2.00 [0.62, 6.45]
Barsoum 1990	8/49	10/49		10.1 %	0.80 [0.34, 1.86]
Yang 1993	5/40	7/40		6.4 %	0.71 [0.25, 2.06]
Tavlan 1996	4/20	5/25		5.2 %	1.00 [0.31, 3.24]
White 2002	1/40	5/40		1.6 %	0.20 [0.02, 1.64]
Agarwal 2002	2/50	2/50		1.9 %	1.00 [0.15, 6.82]
Schultz 2003	6/13	6/16		9.6 %	1.23 [0.52, 2.92]
Gan 2004	3/26	2/25		2.5 %	1.44 [0.26, 7.92]
Misra 2005	13/38	11/39		16.1 %	1.21 [0.62, 2.36]
Sharma 2007	0/20	2/20		0.8 %	0.20 [0.01, 3.92]
Sadighha 2008	10/51	21/53		17.1 %	0.49 [0.26, 0.95]
El-Deeb 2011	11/150	9/150		9.9 %	1.22 [0.52, 2.86]
Direkvand-Moghadam 2013	6/34	4/34		5.2 %	1.50 [0.46, 4.84]
Subtotal (95% CI)	**643**	**628**		**100.0 %**	**0.94 [0.72, 1.22]**
Total events: 89 (PC6 acupoint), 95 (Antiemetic)					
Heterogeneity: Tau^2 = 0.0; Chi^2 = 11.08, df = 13 (P = 0.60); I^2 =0.0%					
Test for overall effect: Z = 0.48 (P = 0.63)					
9 Invasive PC6 stimulation					
Dundee 1989	8/62	8/62		14.8 %	1.00 [0.40, 2.50]
Ho 1990	3/25	1/12		2.7 %	1.44 [0.17, 12.44]

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Study or subgroup	PC6 acupoint n/N	Antiemetic n/N	Risk Ratio IV,Random,95% CI	Weight	Risk Ratio IV,Random,95% CI
Yentis 1992	13/29	12/29		35.3 %	1.08 [0.60, 1.96]
Yang 1993	5/40	7/40		11.0 %	0.71 [0.25, 2.06]
Tavlan 1996	4/20	5/25		9.0 %	1.00 [0.31, 3.24]
Sharma 2007	0/20	2/20		1.4 %	0.20 [0.01, 3.92]
Ravi 2010	4/25	5/25		8.7 %	0.80 [0.24, 2.64]
El-Deeb 2011	11/150	9/150		17.1 %	1.22 [0.52, 2.86]
Subtotal (95% CI)	**371**	**363**		**100.0 %**	**0.99 [0.70, 1.41]**
Total events: 48 (PC6 acupoint), 49 (Antiemetic)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 2.04$, df = 7 (P = 0.96); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.04 (P = 0.97)					
10 Noninvasive PC6 stimulation					
Barsoum 1990	8/49	10/49		12.5 %	0.80 [0.34, 1.86]
Ho 1990	9/25	2/13		4.6 %	2.34 [0.59, 9.28]
White 2002	1/40	5/40		2.0 %	0.20 [0.02, 1.64]
Agarwal 2002	2/50	2/50		2.4 %	1.00 [0.15, 6.82]
Wang 2002	6/50	9/49		9.7 %	0.65 [0.25, 1.70]
Schultz 2003	6/13	6/16		11.8 %	1.23 [0.52, 2.92]
Gan 2004	3/26	2/25		3.0 %	1.44 [0.26, 7.92]
Misra 2005	13/38	11/39		19.8 %	1.21 [0.62, 2.36]
Butkovic 2005	5/40	4/40		5.7 %	1.25 [0.36, 4.32]
Sadighha 2008	10/51	21/53		21.0 %	0.49 [0.26, 0.95]
Ebrahim Soltani 2010	0/50	3/100		1.0 %	0.28 [0.01, 5.37]
Direkvand-Moghadam 2013	6/34	4/34		6.4 %	1.50 [0.46, 4.84]
Subtotal (95% CI)	**466**	**508**		**100.0 %**	**0.90 [0.67, 1.21]**
Total events: 69 (PC6 acupoint), 79 (Antiemetic)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 10.77$, df = 11 (P = 0.46); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.72 (P = 0.47)					
11 Low risk of bias trials					
Gan 2004	3/26	2/25		100.0 %	1.44 [0.26, 7.92]
Subtotal (95% CI)	**26**	**25**		**100.0 %**	**1.44 [0.26, 7.92]**
Total events: 3 (PC6 acupoint), 2 (Antiemetic)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.42 (P = 0.67)					
12 Unclear risk of bias trials					
Dundee 1989	8/62	8/62		16.5 %	1.00 [0.40, 2.50]

0.005 0.1 1 10 200

Favours PC6 stimulation Favours antiemetic

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Study or subgroup	PC6 acupoint n/N	Antiemetic n/N	Risk Ratio IV,Random,95% CI	Weight	Risk Ratio IV,Random,95% CI
Tavlan 1996	4/20	5/25		10.0 %	1.00 [0.31, 3.24]
White 2002	1/40	5/40		3.1 %	0.20 [0.02, 1.64]
Agarwal 2002	2/50	2/50		3.7 %	1.00 [0.15, 6.82]
Wang 2002	6/50	9/49		15.1 %	0.65 [0.25, 1.70]
Misra 2005	13/38	11/39		31.0 %	1.21 [0.62, 2.36]
Ebrahim Soltani 2010	0/50	3/100		1.6 %	0.28 [0.01, 5.37]
El-Deeb 2011	11/150	9/150		19.0 %	1.22 [0.52, 2.86]
Subtotal (95% CI)	**460**	**515**		**100.0 %**	**0.96 [0.66, 1.40]**
Total events: 45 (PC6 acupoint), 52 (Antiemetic)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 4.22$, df = 7 (P = 0.75); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.19 (P = 0.85)					
13 High risk of bias trials					
Barsoum 1990	8/49	10/49		12.0 %	0.80 [0.34, 1.86]
Ho 1990	12/50	3/25		6.2 %	2.00 [0.62, 6.45]
Yentis 1992	13/29	12/29		24.2 %	1.08 [0.60, 1.96]
Yang 1993	5/40	7/40		7.5 %	0.71 [0.25, 2.06]
Schultz 2003	6/13	6/16		11.4 %	1.23 [0.52, 2.92]
Butkovic 2005	5/40	4/40		5.5 %	1.25 [0.36, 4.32]
Sharma 2007	0/20	2/20		1.0 %	0.20 [0.01, 3.92]
Sadighha 2008	10/51	21/53		20.2 %	0.49 [0.26, 0.95]
Ravi 2010	4/25	5/25		6.0 %	0.80 [0.24, 2.64]
Direkvand-Moghadam 2013	6/34	4/34		6.2 %	1.50 [0.46, 4.84]
Subtotal (95% CI)	**351**	**331**		**100.0 %**	**0.91 [0.68, 1.21]**
Total events: 69 (PC6 acupoint), 74 (Antiemetic)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 8.22$, df = 9 (P = 0.51); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.67 (P = 0.50)					
14 Trials with control event rate less than or equal to 20%					
Dundee 1989	8/62	8/62		11.3 %	1.00 [0.40, 2.50]
Ho 1990	12/50	3/25		6.9 %	2.00 [0.62, 6.45]
Barsoum 1990	8/49	10/49		13.4 %	0.80 [0.34, 1.86]
Yang 1993	5/40	7/40		8.4 %	0.71 [0.25, 2.06]
Tavlan 1996	4/20	5/25		6.8 %	1.00 [0.31, 3.24]
Wang 2002	6/50	9/49		10.4 %	0.65 [0.25, 1.70]
Agarwal 2002	2/50	2/50		2.6 %	1.00 [0.15, 6.82]

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Study or subgroup	PC6 acupoint n/N	Antiemetic n/N	Risk Ratio IV,Random,95% CI	Weight	Risk Ratio IV,Random,95% CI
White 2002	1/40	5/40		2.1 %	0.20 [0.02, 1.64]
Gan 2004	3/26	2/25		3.3 %	1.44 [0.26, 7.92]
Butkovic 2005	5/40	4/40		6.2 %	1.25 [0.36, 4.32]
Sharma 2007	0/20	2/20		1.1 %	0.20 [0.01, 3.92]
Ravi 2010	4/25	5/25		6.7 %	0.80 [0.24, 2.64]
Ebrahim Soltani 2010	0/50	3/100		1.1 %	0.28 [0.01, 5.37]
El-Deeb 2011	11/150	9/150		13.0 %	1.22 [0.52, 2.86]
Direkvand-Moghadam 2013	6/34	4/34		6.9 %	1.50 [0.46, 4.84]
Subtotal (95% CI)	**706**	**734**		**100.0 %**	**0.95 [0.70, 1.29]**
Total events: 75 (PC6 acupoint), 78 (Antiemetic)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 7.84$, df = 14 (P = 0.90); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.35 (P = 0.73)					
15 Trials with control event rate more than 20%					
Yentis 1992	13/29	12/29		29.4 %	1.08 [0.60, 1.96]
Schultz 2003	6/13	6/16		18.3 %	1.23 [0.52, 2.92]
Misra 2005	13/38	11/39		25.7 %	1.21 [0.62, 2.36]
Sadighha 2008	10/51	21/53		26.6 %	0.49 [0.26, 0.95]
Subtotal (95% CI)	**131**	**137**		**100.0 %**	**0.93 [0.60, 1.43]**
Total events: 42 (PC6 acupoint), 50 (Antiemetic)					
Heterogeneity: $Tau^2 = 0.08$; $Chi^2 = 4.91$, df = 3 (P = 0.18); $I^2 = 39\%$					
Test for overall effect: Z = 0.34 (P = 0.73)					

Analysis 2.2.
Comparison 2 Acupoint PC6 stimulation versus antiemetic drug, Outcome 2 Vomiting.

Review: Stimulation of the wrist acupuncture point PC6 for preventing postoperative nausea and vomiting

Comparison: 2 Acupoint PC6 stimulation versus antiemetic drug

Outcome: 3 Rescue antiemetic

Study or subgroup	PC6 stimulation n/N	Antiemetic n/N	Risk Ratio IV,Random,95% CI	Weight	Risk Ratio IV,Random,95% CI
Wang 2002	21/50	25/49		47.4 %	0.82 [0.54, 1.26]
White 2002	8/40	12/40		14.1 %	0.67 [0.31, 1.45]
Agarwal 2002	0/50	0/50			Not estimable
Gan 2004	5/26	7/25		8.5 %	0.69 [0.25, 1.88]
Misra 2005	9/38	7/39		11.1 %	1.32 [0.55, 3.18]
Butkovic 2005	1/40	1/40		1.1 %	1.00 [0.06, 15.44]
Sharma 2007	0/20	2/20		1.0 %	0.20 [0.01, 3.92]
El-Deeb 2011	13/150	12/150		15.2 %	1.08 [0.51, 2.30]
Direkvand-Moghadam 2013	2/34	1/34		1.6 %	2.00 [0.19, 21.03]
Total (95% CI)	**448**	**447**		**100.0 %**	**0.87 [0.65, 1.16]**
Total events: 59 (PC6 stimulation), 67 (Antiemetic)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 3.34$, df = 7 (P = 0.85); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.96 (P = 0.34)					
Test for subgroup differences: Not applicable					

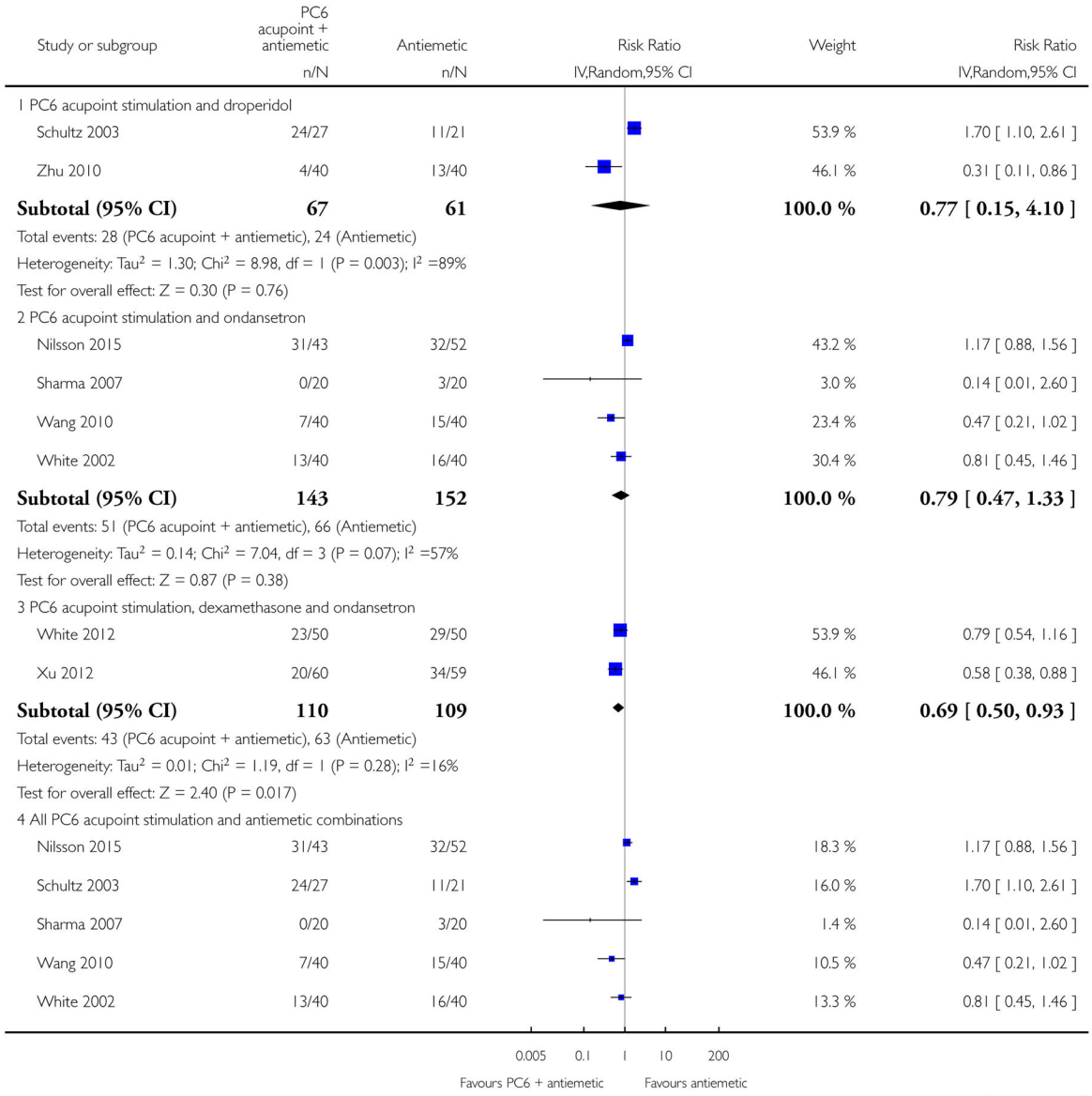
Analysis 2.3.

Comparison 2 Acupoint PC6 stimulation versus antiemetic drug, Outcome 3 Rescue antiemetic.

Review: Stimulation of the wrist acupuncture point PC6 for preventing postoperative nausea and vomiting

Comparison: 3 Acupoint PC6 stimulation and antiemetic combination vs antiemetic

Outcome: 1 Nausea



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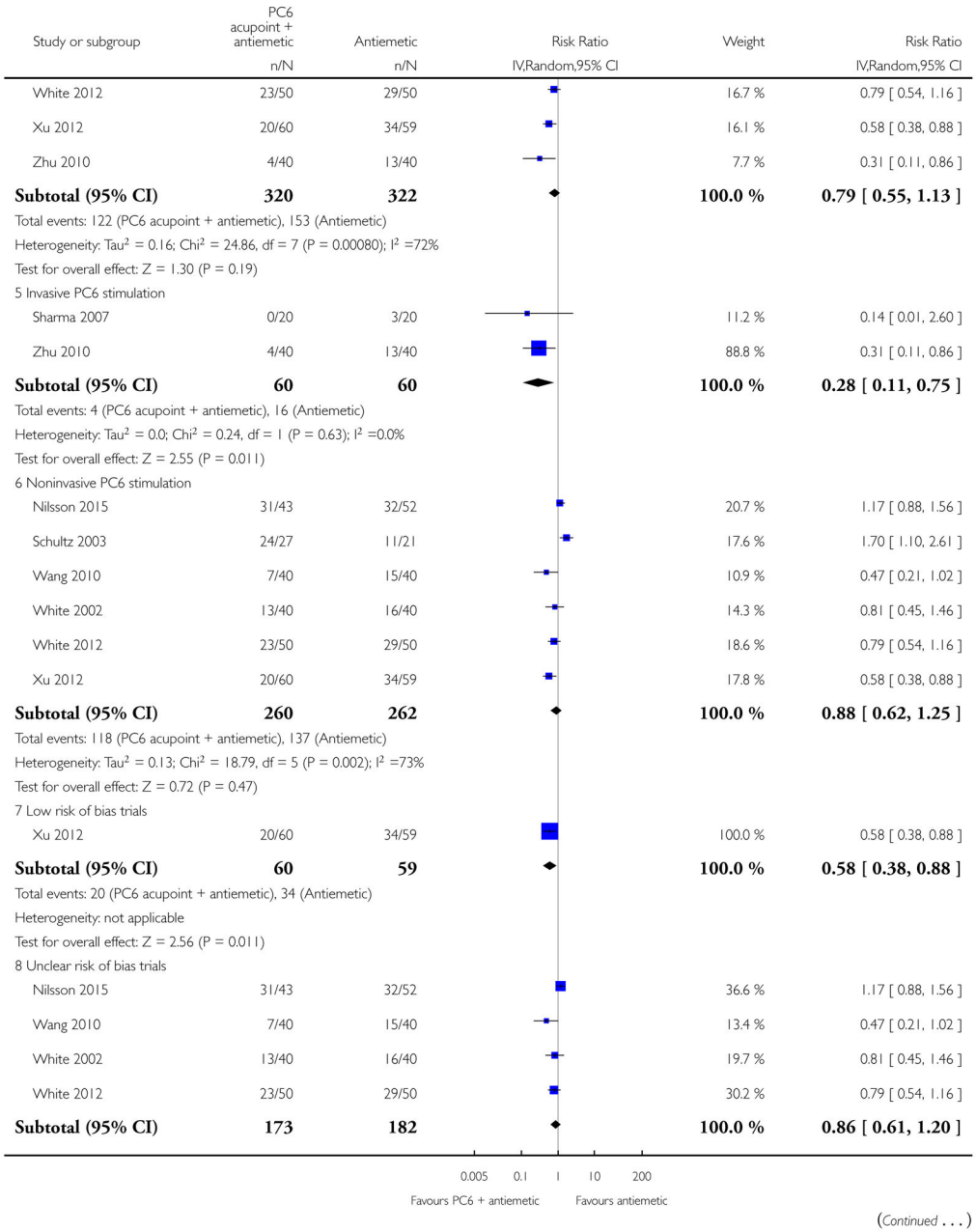

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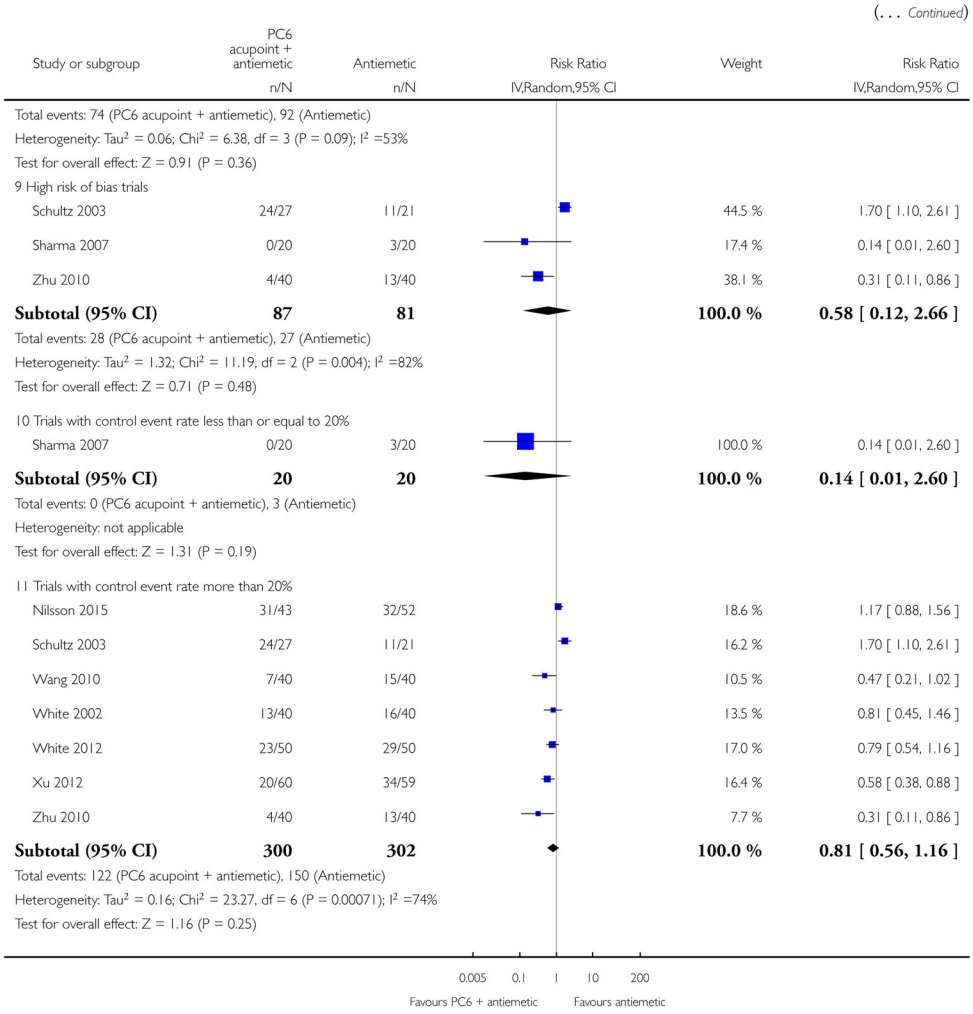


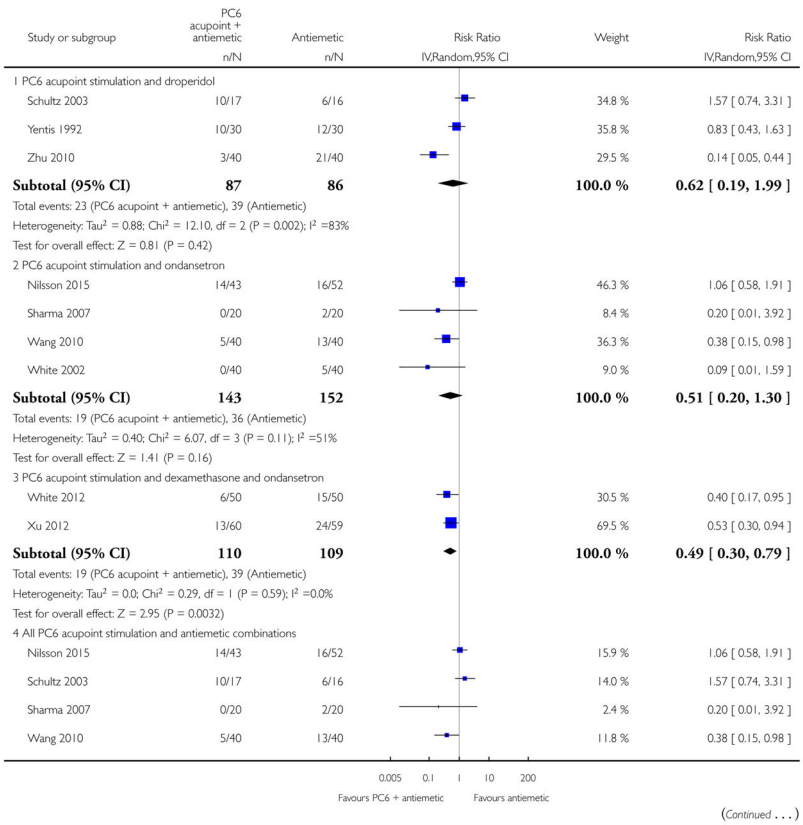
Analysis 3.1.

Comparison 3 Acupoint PC6 stimulation and antiemetic combination vs antiemetic, Outcome 1 Nausea.

Review: Stimulation of the wrist acupuncture point PC6 for preventing postoperative nausea and vomiting

Comparison: 3 Acupoint PC6 stimulation and antiemetic combination vs antiemetic

Outcome: 2 Vomiting



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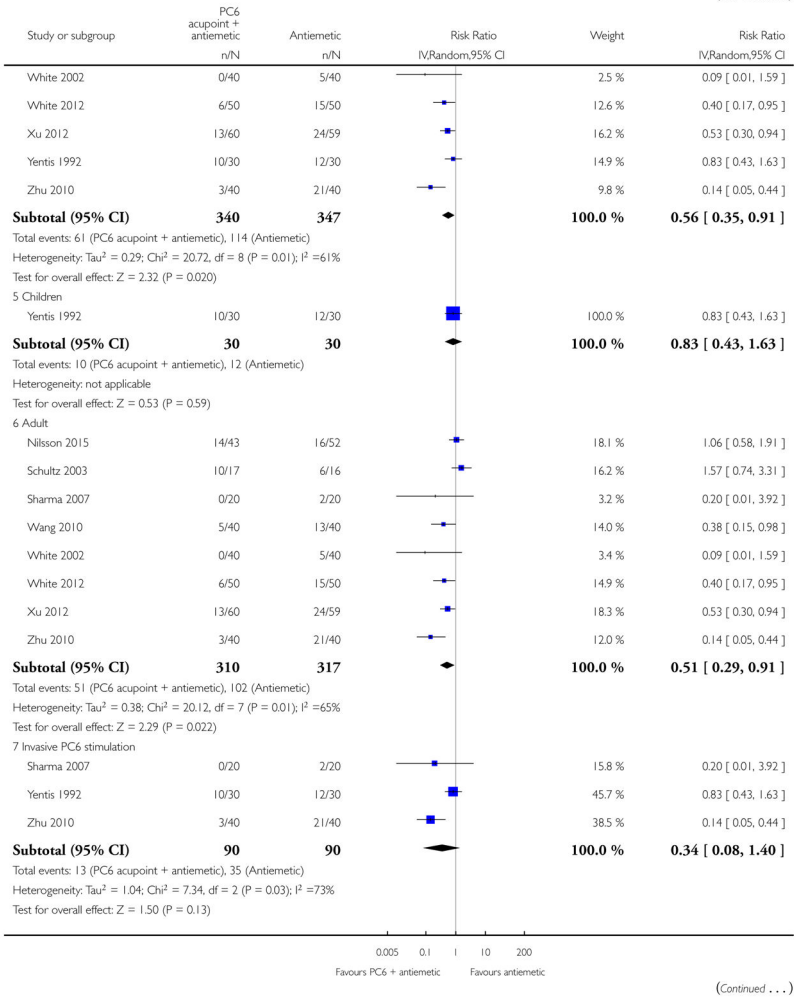

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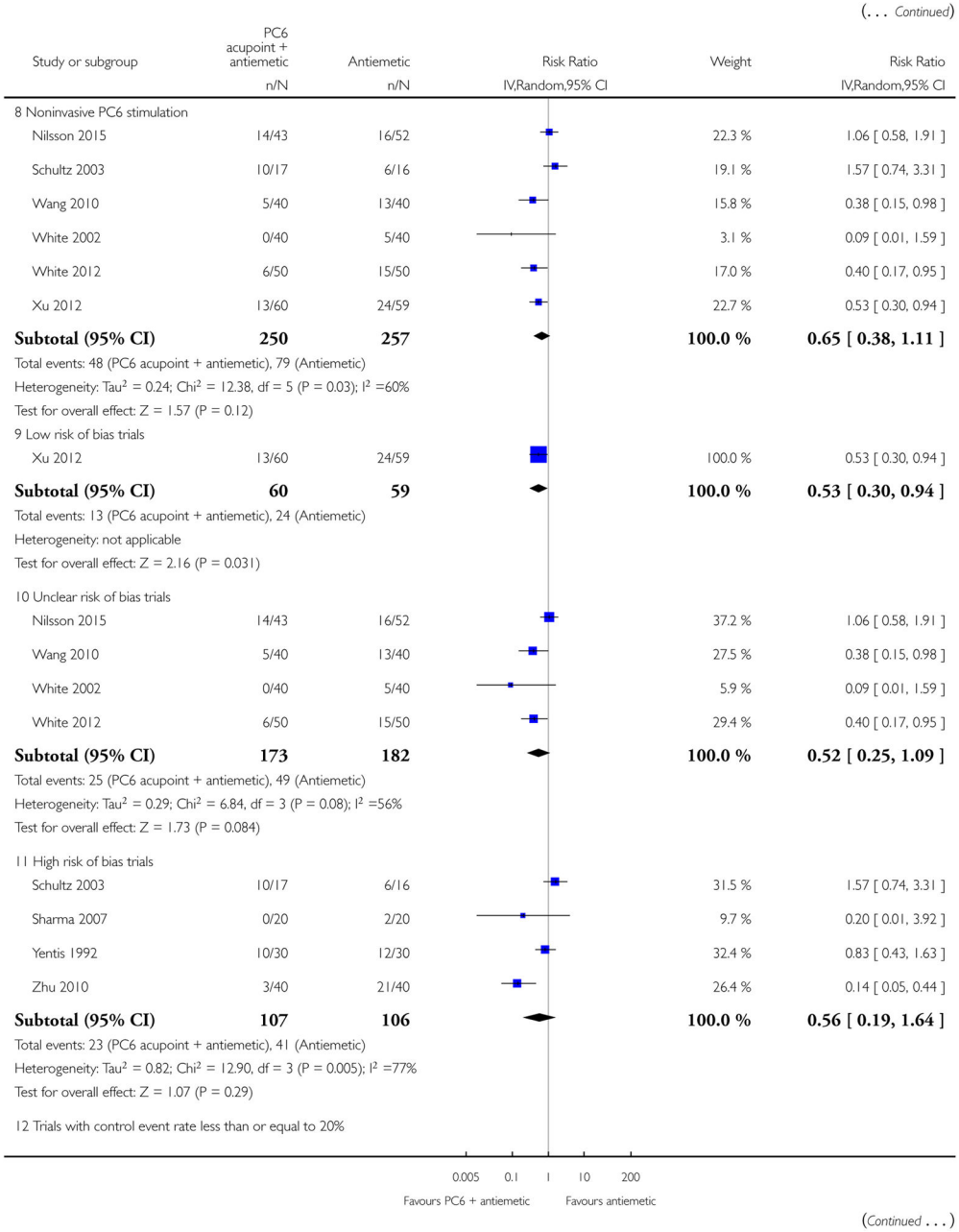

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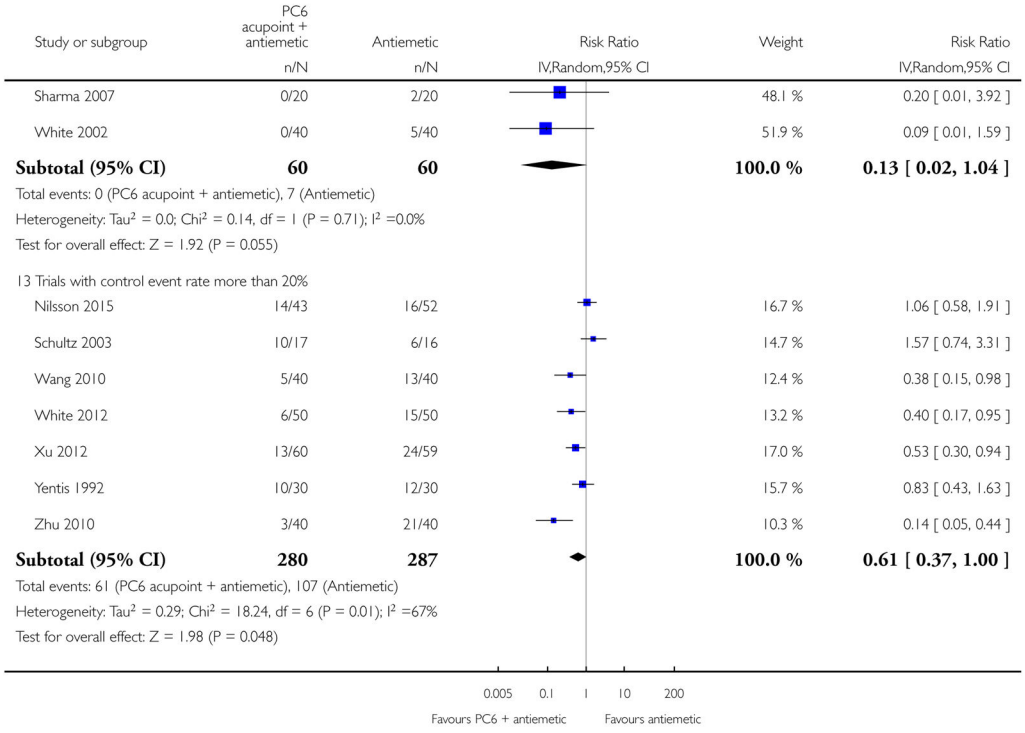
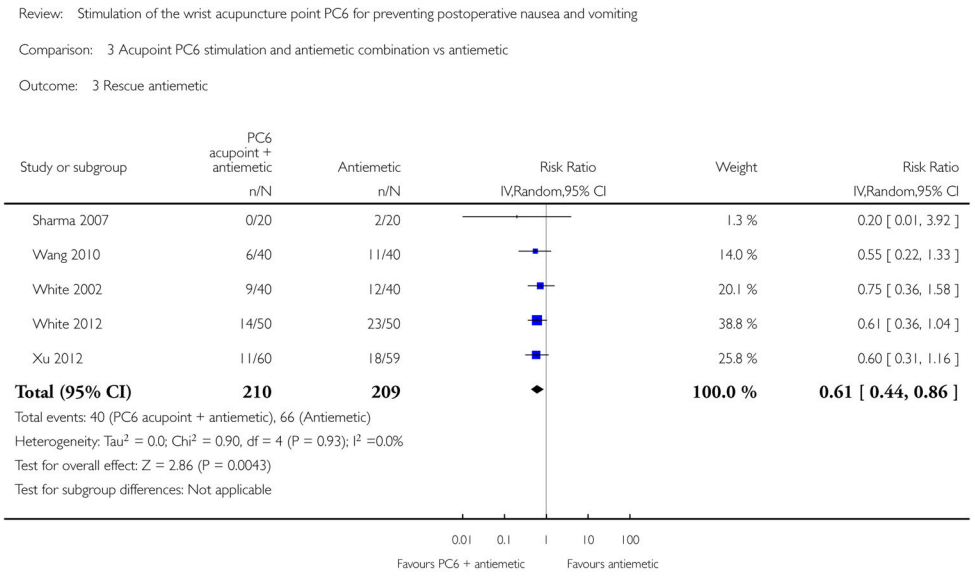


Analysis 3.2.
Comparison 3 Acupoint PC6 stimulation and antiemetic combination vs antiemetic, Outcome 2 Vomiting.



Analysis 3.3.
Comparison 3 Acupoint PC6 stimulation and antiemetic combination vs antiemetic, Outcome 3 Rescue antiemetic.

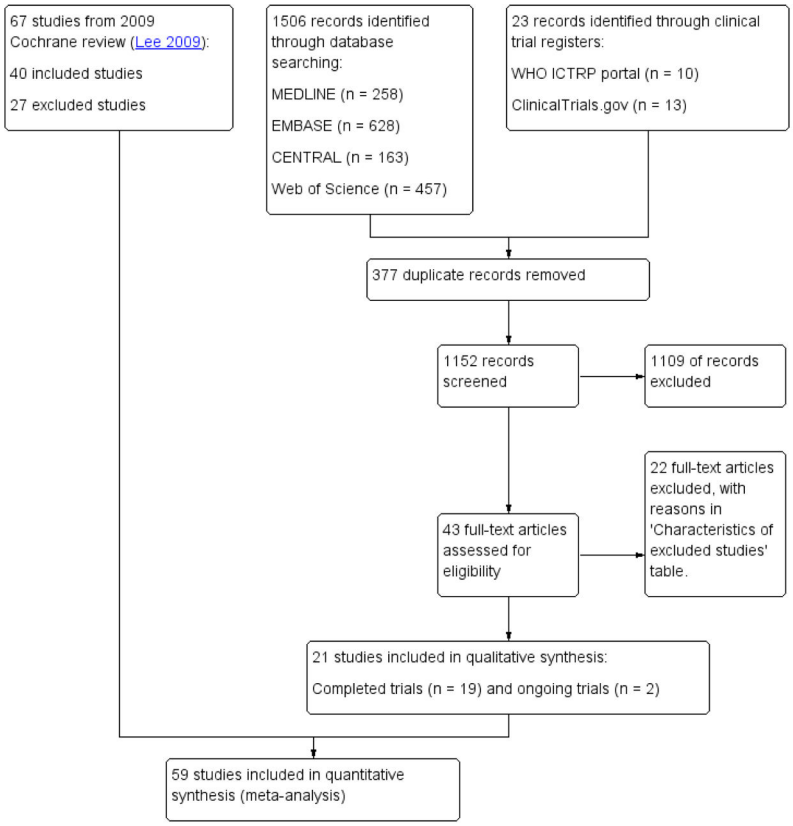


Figure 1.
Study flow diagram.

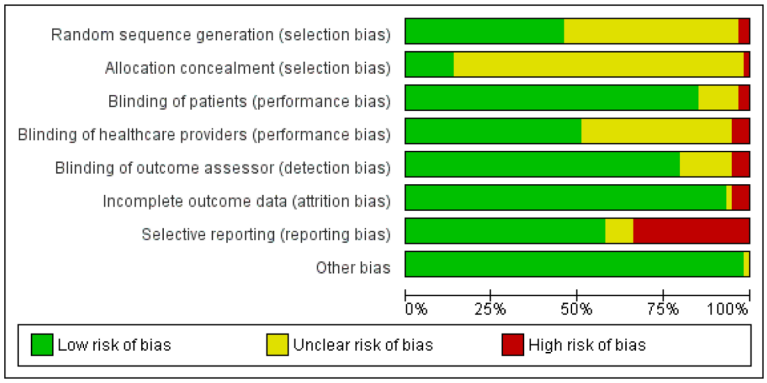


Figure 2.

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

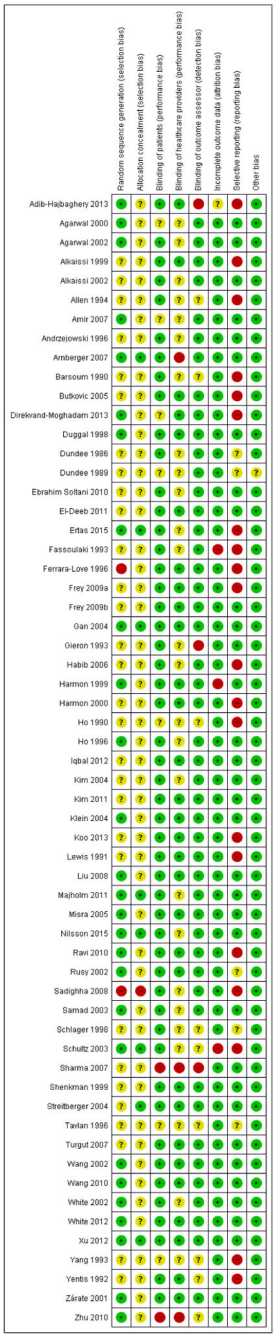


Figure 3.

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

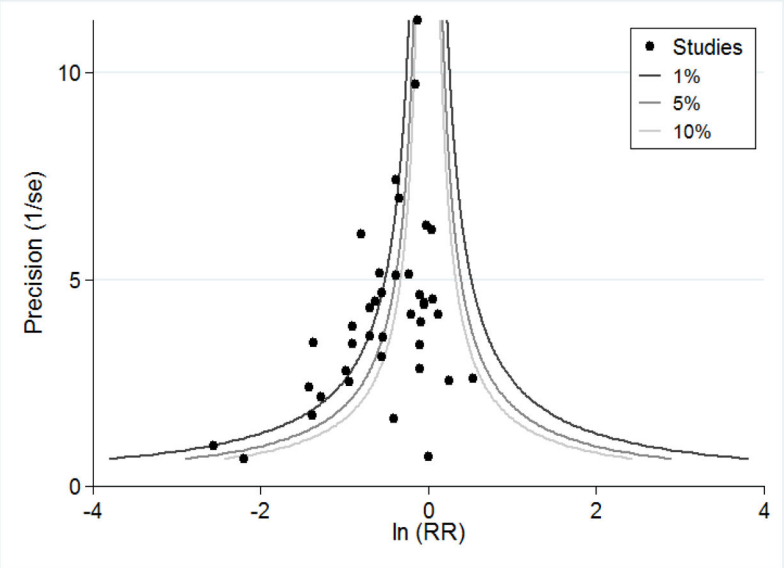


Figure 4.

Contour-enhanced funnel plot of comparison: PC6 acupoint stimulation versus sham for nausea. Contour lines are at 1%, 5% and 10% levels of statistical significance.

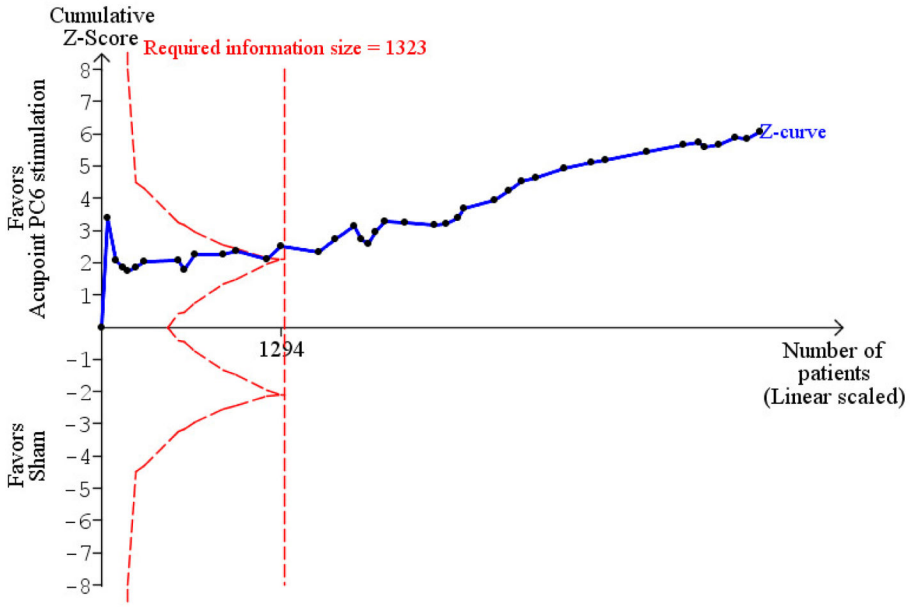


Figure 5.

Trial sequential analysis of 40 trials comparing PC6 acupoint stimulation versus sham (despite risk of bias) for postoperative nausea, with control event proportion of 46.8%, diversity of 71%, α of 5%, power of 80%, and relative risk reduction of 30% (Apfel 2007).

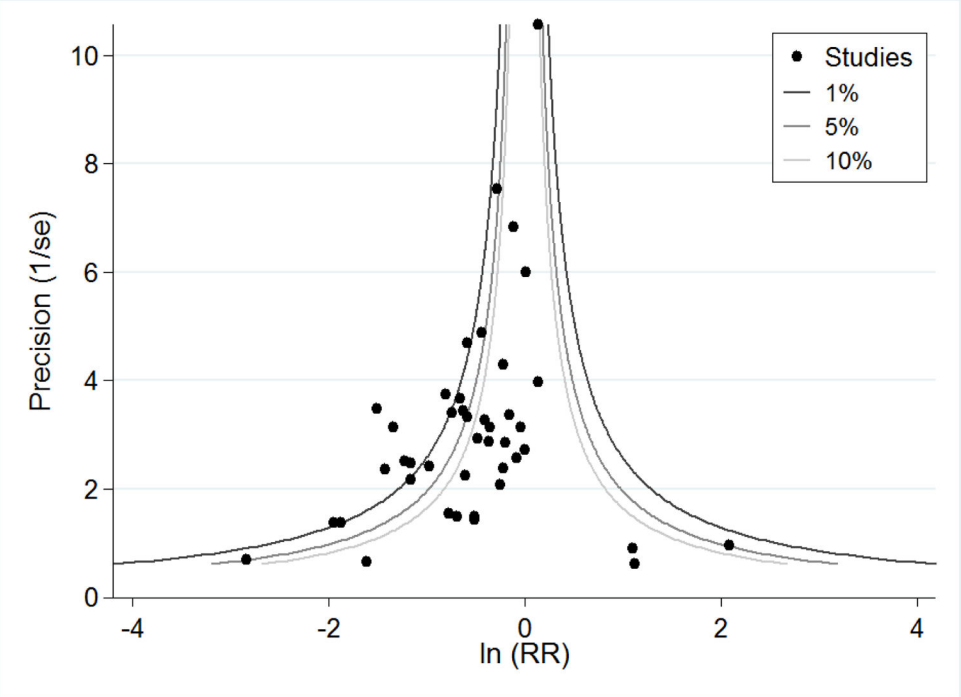


Figure 6.

Contour-enhanced funnel plot of comparison: PC6 acupoint stimulation versus sham for vomiting. Contour lines are at 1%, 5% and 10% levels of statistical significance.

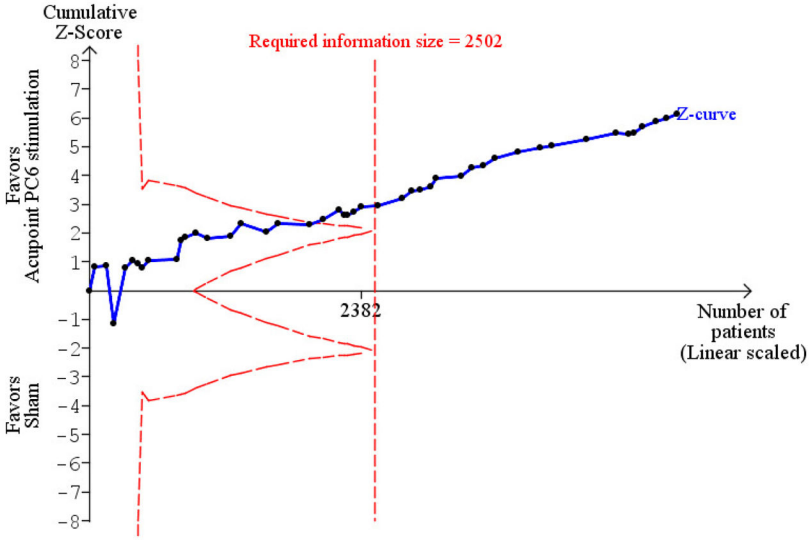


Figure 7.

Trial sequential analysis of 45 trials comparing PC6 acupoint versus sham (despite risk of bias) for postoperative vomiting, with control event proportion of 32.9%, diversity of 74%, α of 5%, power of 80%, and relative risk reduction of 30% (Apfel 2007).

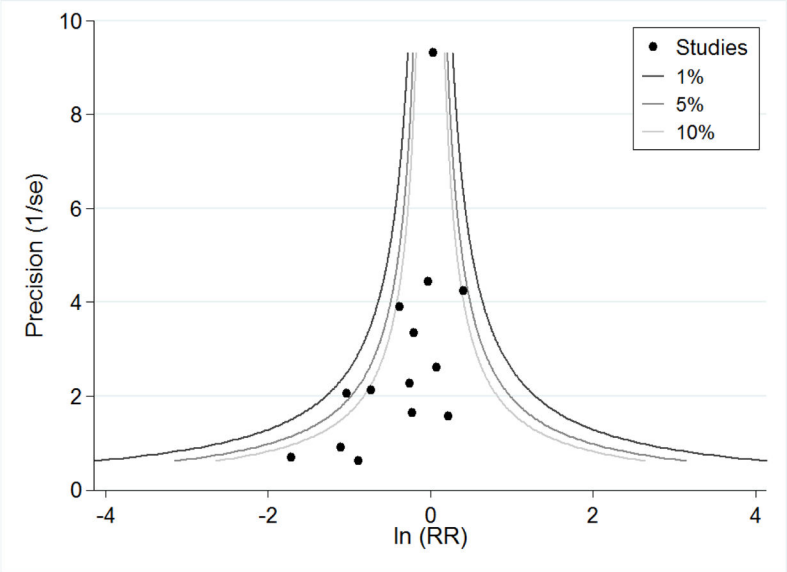


Figure 8.

Contour-enhanced funnel plot of comparison: PC6 acupoint stimulation versus antiemetic for nausea. Contour lines are at 1%, 5% and 10% levels of statistical significance.

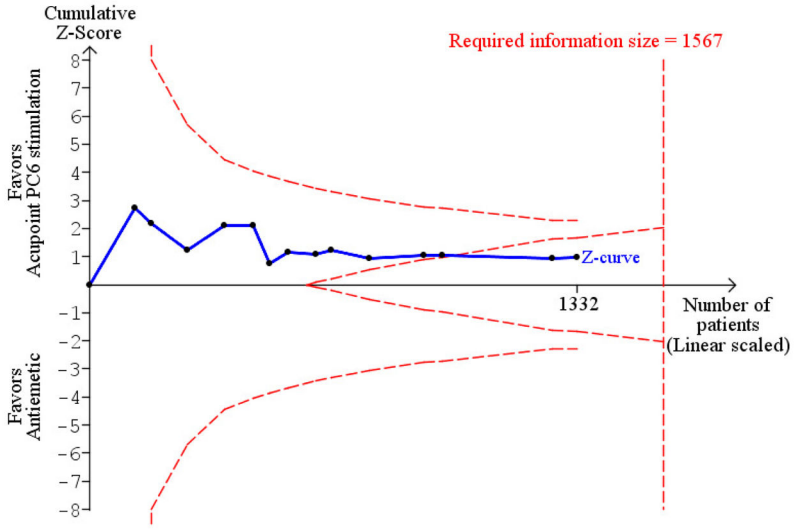


Figure 9.

Trial sequential analysis of 14 trials of PC6 acupoint stimulation versus antiemetic (despite risk of bias) for postoperative nausea, with control event proportion of 25.0%, diversity of 40%, α of 5%, power of 80%, and relative risk reduction of 30% (Apfel 2007).

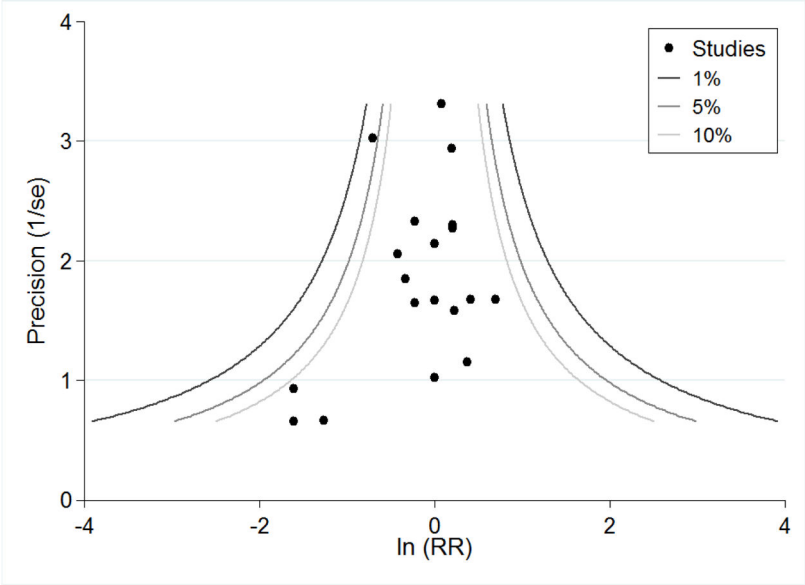


Figure 10.

Contour-enhanced funnel plot of comparison: PC6 acupoint stimulation versus antiemetic for vomiting. Contour lines are at 1%, 5% and 10% levels of statistical significance.

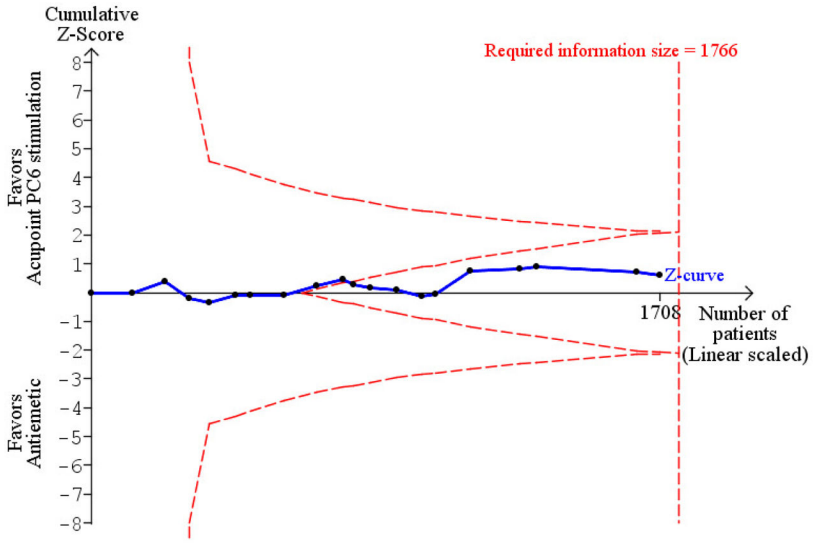


Figure 11.

Trial sequential analysis of 19 trials comparing PC6 acupoint stimulation versus antiemetic (despite risk of bias) for postoperative vomiting, with control event proportion of 14.7%, diversity of 0%, α of 5%, power of 80%, and relative risk reduction of 30% (Apfel 2007).

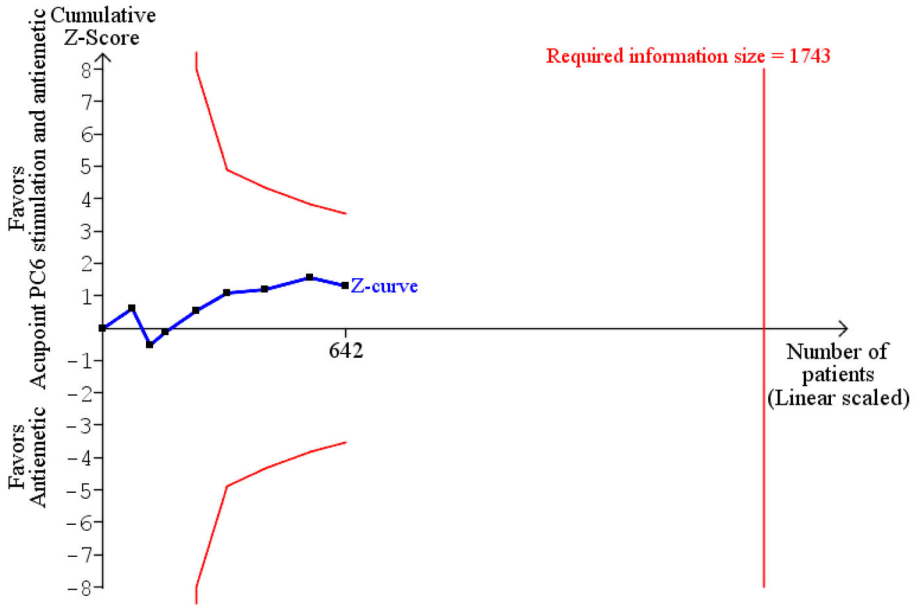


Figure 12.

Trial sequential analysis of 8 trials comparing PC6 acupoint and antiemetic versus antiemetic (despite risk of bias) for postoperative nausea, with control event proportion of 47.5%, diversity of 79%, α of 5%, power of 80%, and relative risk reduction of 30% (Apfel 2007).

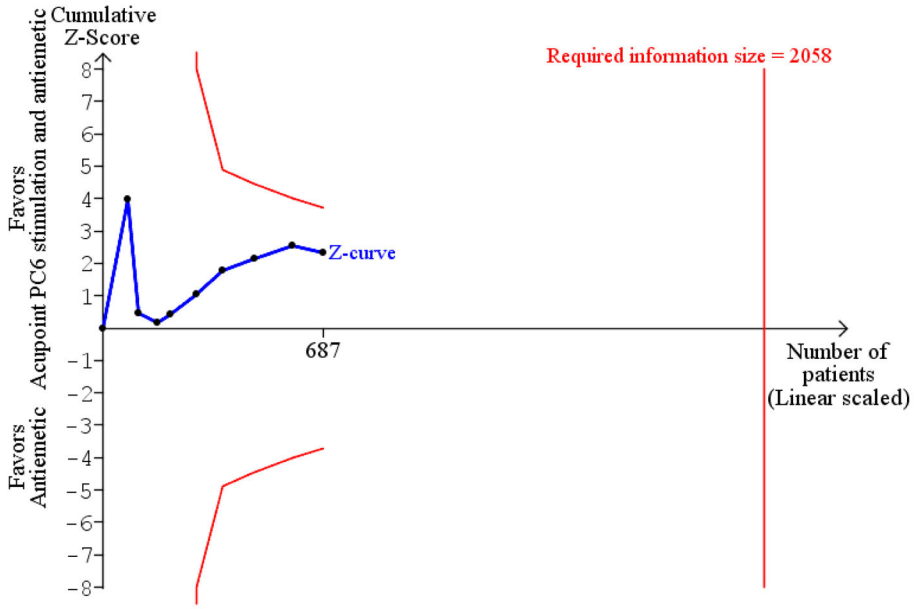


Figure 13.

Trial sequential analysis of 9 trials comparing PC6 acupoint stimulation and antiemetic versus antiemetic (despite risk of bias) for postoperative vomiting, with control event proportion of 32.9%, diversity of 68%, α of 5%, power of 80%, and relative risk reduction of 30% (Apfel 2007).

Table 1

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

Cooke 2014	
Trial name or title	PC6 acupoint stimulation for prevention of postoperative nausea and vomiting in patients undergoing cardiac surgery
Methods	2-centred, double-blinded, 2-arm, parallel-group RCT
Participants	People undergoing primary cardiac surgery
Interventions	Group 1: Seaband wristband applied bilaterally to PC6 acupoint on arrival to ICU, covered by light opaque bandage for 36 hours Group 2: Sham Seaband wristband without stud applied to both wrists on arrival to ICU, covered by light opaque bandage for 36 hours
Outcomes	Nausea (0 – 6 h, 0 – 12 h, 0 – 24 h, 0 – 36 h), vomiting (0 – 6 h, 0 – 12 h, 0 – 24 h, 0 – 36 h), rescue antiemetic (0 – 36 h)
Starting date	February 2015
Contact information	m.cooke@griffith.edu.au
Notes	Rescue antiemetic includes metoclopramide, ondansetron, dexamethasone, droperidol. The trial is registered with the Australian and New Zealand Clinical Trials Registry (ACTRN12614000589684)
Lv 2013	
Trial name or title	PC6 acupoint stimulation for prevention of postoperative nausea and vomiting in patients undergoing craniotomy
Methods	Single-centred, double-blinded, 5-arm, parallel-group RCT
Participants	People undergoing craniotomy
Interventions	Group 1: Ondansetron 8 mg IV before skin closure and PC6 acupuncture bilaterally for 30 min after regaining consciousness from general anaesthesia with stimulation every 10 min to keep de qi sensation Group 2: Ondansetron 8 mg IV before skin closure and sham PC6 acupuncture bilaterally for 30 min after regaining consciousness from general anaesthesia with no stimulation Group 3: Ondansetron 8 mg IV before skin closure and PC6 stimulation via active TENS electrodes bilaterally for 30 min after regaining consciousness from general anaesthesia with stimulation intensity and frequency set to when de qi sensation is felt Group 4: Ondansetron 8 mg IV before skin closure and PC6 stimulation via inactive TENS electrodes bilaterally for 30 min after regaining consciousness from general anaesthesia with no stimulation intensity and frequency Group 5: Ondansetron 8 mg IV before skin closure.
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), rescue antiemetic (metoclopramide)
Starting date	January 2013
Contact information	zhenjiuhuaxi@163.com.
Notes	Protocol published in Trials 2013 May 28;14:153. doi: 10.1186/1745-6215-14-153. This study is registered with the Chinese Clinical Trial Registry: ChiCTR-TRC-13003026

h = hours

ICU = Intensive care unit

IV = intravenous

PC6 = pericardium acupoint

RCT = randomized controlled trial

TENS = transcutaneous electrical nerve stimulation

Table 2

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

Adib-Hajbaghery 2013		
Methods	Parallel-group, blinded randomized trial, conducted in Iran. Study dates not reported	
Participants	88 people aged 15 – 70 years undergoing appendectomy under general anaesthesia. Exclusion: past history of nausea and vomiting in the past 24 h, prior use of acupressure or acupuncture, history of gastrointestinal or ear disorders, neurological impairment, fever, unanticipated perioperative complications	
Interventions	Acupressure wristband placed at P6 points on both wrists, applied in the recovery room when participant was awake and removed after 7 hours following surgery (n = 44) Sham group was acupressure wristbands without bead on P6 points applied to both wrists, applied in the recovery room when participant was awake and removed after 7 hours following surgery (n = 44)	
Outcomes	Nausea (0 – 7 h), vomiting (0 – 7 h), risk of rescue antiemetic (metoclopramide 10 mg)	
Notes	No power calculation done. Funding sources not declared. Authors declare no conflict of interest in the study	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Participants were "randomly allocated to two groups using a dice (odd numbers to the acupressure group and even numbers to the control group."
Allocation concealment (selection bias)	Unclear risk	Insuffient information.
Blinding of patients (performance bias) All outcomes	Low risk	Participants blinded to intervention.
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"Staff blinded to grouping".
Blinding of outcome assessor (detection bias) All outcomes	High risk	Researcher and nurse likely to know allocation group.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information.
Selective reporting (reporting bias)	High risk	Participant discomfort with wristbands monitored by researchers every 2 hours but not reported
Other bias	Low risk	Baseline characteristics for age, body mass index, duration of anaesthesia and incision length were comparable
Agarwal 2000		
Methods	Parallel-group randomized trial, conducted in India. Study dates not reported	
Participants	200 people 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 H_2 receptor antagonist within 72 hours of surgery. No participant 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 (n = 100) 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 (n = 100)	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), 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. No details about funding source or any declarations of interest among authors	

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Patients were assigned to two different groups according to a computer-generated table of random numbers"
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"An anesthesiologist blinded to the therapy registered the incidence of nausea and vomiting at three different times in the first 24 hr postoperatively: on arrival of the patient in PACU, and at six hours (time of removal of acupressure wristband) and 24 hr after operation"
Incomplete outcome data (attrition bias) All outcomes	Low risk	"No patient was excluded after admission to the study".
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable: "Patients were comparable in both the groups as regards to age, sex, height and weight"
Agarwal 2002		
Methods	Parallel-group randomized trial, conducted in India. Study dates not reported	
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 H_2 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) (n = 50) 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) (n = 50) Antiemetic group was ondansetron 4 mg IV just before induction of anaesthesia (plus sham treatment outlined above) (n = 50)	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), risk of rescue antiemetic drug	
Notes	Rescue antiemetic was ondansetron 4 mg IV if participant vomited more than once. No side effects or complications noted in any of the groups. Data for outcome (0 – 24 h) obtained by correspondence with author. No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Patients were randomised into three groups of 50 each using a table of random numbers.."
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar

Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"The incidence of PONV was evaluated by a blinded observer".
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for 150 patients randomized.
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable: "Patients were comparable in both the groups as regards to age, sex, height, weight and duration of surgery"
Alkaissi 1999		
Methods	Parallel-group randomized trial, conducted in Sweden. Study dates not reported	
Participants	60 women undergoing day-case minor gynaecological surgery. Exclusion: patients undergoing local anaesthesia and those given prophylactic antiemetic during anaesthesia (n = 10, replaced by randomizing another 10 participants 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 (n = 20) 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 (n = 20) Reference group were informed and anaesthetized in the same way as the other 2 groups (n = 20)	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), risk of rescue antiemetic drugs	
Notes	Rescue antiemetics were metoclopramide 10 mg IV at participant's request; if not effective, then given droperidol 1.25 mg IV. Reference group received no treatment and were not included in data analysis. No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"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 PC6 acupoint is located"
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"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 PC6 acupoint is located". These nurses also noted vomiting episodes
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reasons were given for 10 dropouts, who were replaced by randomising another 10 participants at the end of the study. "The dropouts were evenly distributed between the groups." No missing data reported for 60 participants analysed
Selective reporting (reporting bias)	High risk	Primary outcome (PONV) reported. Description of side effects not given
Other bias	Low risk	Demographic data appeared to be comparable.
Alkaissi 2002		

Methods	Parallel-group randomized trial, conducted in Sweden. Study dates not reported	
Participants	410 women undergoing elective gynaecological surgery. No exclusion criteria specified. 30 participants 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 participants 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 h (n = 135) Sham group included acupressure wristbands at non-acupoint on both forearms just before start of anaesthesia, left on for 24 h (n = 139) Reference group received no prophylactic treatment and was not blinded (n = 136)	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), side effects of acupressure, risk of rescue antiemetic (type of drug not described)	
Notes	Reference group received no treatment and were 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 Financial support was provided by the County Council of Östergötland (Project F98–305) Sweden. No details about any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	"The wrists were wrapped for blinding". Participants reported outcomes
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"The wrists were wrapped for blinding". Participants reported outcomes
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reasons were given for 30 dropouts, who were replaced by randomising another 30 participants at the end of the study. "Withdrawals were evenly distributed between the groups." No missing data reported for 410 participants analysed
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Demographic data appeared to be comparable in Table 2.
Allen 1994		
Methods	Parallel-group randomized trial, conducted in England. Study dates not reported	
Participants	46 women undergoing gynaecological surgery. Exclusions: previous exposure to elasticized wristbands for the prevention of motion sickness	
Interventions	Acupressure wristband placed on P6 point of dominant arm before premedication (90 min before surgery) (n = 23). Duration of treatment not given Sham acupressure wristband placed on dorsum of dominant wrist before premedication (n = 23). Duration of treatment not given	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h).	
Notes	Rescue antiemetic was prochlorperazine 12.5 mg IM 4-hourly when necessary. More than 1 dose of prochlorperazine data given (not included in data analysis). No details about funding source or any declarations of interest among authors	
Risk of bias		

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar in participants with no previous experience with this form of acupressure
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Unclear risk	Insufficient information.
Incomplete outcome data (attrition bias) All outcomes	Low risk	"No patient refused to participate in the study, nor were there any withdrawals"
Selective reporting (reporting bias)	High risk	Risk of rescue antiemetic drug (1 or more doses) was not given in the results. Description of side effects not reported
Other bias	Low risk	Baseline characteristics were comparable. "The ages and weights of the patients in the two groups were comparable.."
Amir 2007		
Methods	Parallel-group randomized trial, conducted in India. Study dates not reported	
Participants	40 children and adults undergoing middle ear surgery. Exclusion: People with cardiovascular disease, central nervous system problems, previous history of PONV and/or motion sickness, and smokers. 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 (n = 20) Group 2: sham electro-acupuncture. No details given except that participants experienced needle pricks (n = 20)	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), risk of rescue antiemetic drug (0 – 24 h), 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 participants in the electro-acupuncture group No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"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 (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"A blinded observed collected postoperative data of PONV".

Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for the 20 participants randomized to each group
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable. “Differences in mean age, weight, sex and duration of surgery were statistically insignificant”
Andrzejowski 1996		
Methods	Parallel-group randomized trial, conducted in United Kingdom. Study dates not reported	
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 (n = 18) Sham semipermanent acupuncture needle inserted in sham point 20 min before induction, left in place until second postoperative day (n = 18)	
Outcomes	Nausea (0 – 8 h), vomiting (0 – 8 h), risk of antiemetic rescue drug, side effects	
Notes	Antiemetic rescue was prochlorperazine 12.5 mg IM when necessary. No side effects reported with interventions. No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors’ judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information. “Patients were allocated randomly into one of two groups”
Allocation concealment (selection bias)	Unclear risk	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
Blinding of patients (performance bias) All outcomes	Low risk	Assessments were made by the participants, who were blinded to their treatment
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	Assessments were made by the participants, who were blinded to their treatment
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for 36 participants randomized.
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable. “There was no significant difference between the two groups in age, weight, total morphine consumed, or duration of anaesthesia”
Arnberger 2007		
Methods	Parallel-group randomized trial, conducted in Switzerland and Austria. Study dates not reported	
Participants	220 women undergoing elective gynaecological and abdominal laparoscopic surgery of more than 1 hour duration. Exclusion: pregnant and breast-feeding women, and women with eating disorders, obesity (BMI > 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 participant withdrew from study	

Interventions	P6 group: during anaesthesia, neuromuscular blockade was monitored by a conventional nerve stimulator at a frequency of 1 Hz 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 (n = 110) Sham group: during anaesthesia, neuromuscular blockade was monitored by a conventional nerve stimulator at a frequency of 1 Hz 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 (n = 110)	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), risk of rescue antiemetic drug (0 – 24 h), 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 – 6 h), vomiting (0 – 6 h), and incidence of rescue antiemetic (0 – 6 h) also reported Support was provided solely from institutional sources. Authors declared no conflict of interests	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"After induction of anaesthesia, patients were assigned to one of two groups using a set of computer-generated random numbers"
Allocation concealment (selection bias)	Low risk	"The assignments were kept in sealed, sequentially numbered envelopes until used, and the envelope numbers with the assignment were recorded"
Blinding of patients (performance bias) All outcomes	Low risk	"Patients and PONV evaluators were not informed of the group assignments"
Blinding of healthcare providers (performance bias) All outcomes	High risk	"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 (detection bias) All outcomes	Low risk	"Patients and PONV evaluators were not informed of the group assignments"
Incomplete outcome data (attrition bias) All outcomes	Low risk	"Two hundred twenty patients were recruited for this study without any dropout over the observation period"
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable. "Demographic and morphometric characteristics and factors likely to influence PONV were similar in the two groups"
Barsoum 1990		
Methods	Parallel-group randomized trial, conducted in England. Study dates not reported	
Participants	162 people undergoing general surgery. 10 participants 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 (n = 49) Sham acupressure wristbands (no studs) were applied to both wrists in the recovery room and antiemetics given only if clinically required (n = 54) 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 (n = 49)	
Outcomes	Vomiting (0 – 24 h), risk of rescue antiemetic (prochlorperazine)	
Notes	Nausea scores were reported for those participants who could not eat. Number of participants who were free of nausea was not given. Vomiting on postoperative day 2 and 3 also reported. 4 participants reported some local tightness and discomfort (1 of these experienced carpal tunnel-like symptoms) No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**

Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar and all participants were told that they were wearing wristbands to try to prevent PONV
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Unclear risk	Insufficient information.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reasons for withdrawals were given. No missing data reported for the 152 participants analysed
Selective reporting (reporting bias)	High risk	Severity of nausea was reported but risk of nausea was not.
Other bias	Low risk	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”
Butkovic 2005		
Methods	Parallel-group randomized trial, conducted in Croatia. Study dates not reported	
Participants	120 children (5 – 14 years) undergoing hernia repair, circumcision, or orchidopexy. Exclusion: children 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 (n = 40) Group 2: metoclopramide 0.15 mg/kg IV and sham laser on P6 acupoint bilaterally for 1 min, 15 min before induction of anaesthesia (n = 40) Group 3: sham laser stimulation on P6 acupoint bilaterally for 1 min, 15 min before induction of anaesthesia and saline infusion (n = 40)	
Outcomes	Vomiting (0 – 2 h), risk of rescue antiemetic drug.	
Notes	Rescue antiemetic was ondansetron 0.1 mg/kg IV if vomiting was severe. No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors’ judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make intervention appear similar
Blinding of healthcare providers (performance bias) All outcomes	Low risk	“Researchers were double-blinded” but no specific details about how blinding was achieved. Comment: probably done
Blinding of outcome assessor (detection bias) All outcomes	Low risk	“Researchers were double-blinded” but no specific details about how blinding was achieved. Comment: probably done

Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for the 120 children analysed.
Selective reporting (reporting bias)	High risk	Description of side effects not included. Nausea not reported because it may be difficult to assess in children
Other bias	Low risk	Baseline characteristics were comparable. "Demographic data showed no significant difference among groups"
Direkvand-Moghadam 2013		
Methods	Parallel 3-arm randomized trial, conducted in Iran. Study conducted from September 2011 to October 2012	
Participants	102 healthy women, aged 18 – 35 years, at first to fourth pregnancy, with normal foetal heart rates, undergoing Caesaren delivery with spinal anaesthesia between 29 September 2011 to 23 October 2012 at University Hospital of Ilam, West of Iran. Exclusion: Acute or chronic diseases associated with nausea and vomiting, carpal tunnel syndrome, preoperative opioids, weights < 50 kg or > 100 kg	
Interventions	Group 1: No P6 treatment group (n = 34) Group 2: Metoclopramide IV before spinal anaesthesia induction (n = 34) Group 3: P6 acupressure wristbands applied to both wrists 15 min before spinal anaesthesia induction and removed 6 hours after surgery (n = 34)	
Outcomes	Nausea (0 – 6 h), vomiting (0 – 6 h), risk of rescue antiemetic drugs (0 – 6 h)	
Notes	All treatment groups were used in the analysis. Details of exact type of rescue antiemetic were not given. Power calculation done. Funding from Ilam University of Medical Sciences. No financial or other competing interests declared by authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Patients were randomly assigned to one of the three groups by a trained midwife, with 34 cases in each group, at the obstetrical triage unit, by using a random number chart"
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Unclear risk	Insufficent information.
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"The researcher was not aware of grouping of participants".
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"The data collection was carried out by a trained midwife who was not also aware of each medication and who had no idea about the plan of the study. "
Incomplete outcome data (attrition bias) All outcomes	Low risk	"None of the 102 enrolled parturients were withdrawn for any reason"
Selective reporting (reporting bias)	High risk	Description of side-effects of acupressure or metoclopramide were not reported
Other bias	Low risk	Baseline characteristics (age, weight, height, gestational age, duration of surgery" were comparable
Duggal 1998		
Methods	Parallel-group randomized trial, conducted in Canada. Study dates not reported	
Participants	263 women undergoing spinal anaesthesia for elective Caesarean delivery. Excluded: women with a history of hyperemesis gravidarum or if they had received antiemetic medication during the 48 h before surgery. 8 women excluded for failing to wear wristbands for 10 hours, 3 had received prophylactic antiemetics, and 8 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 (n = 122) 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 (n = 122)	
Outcomes	Nausea (0 – 10 h), vomiting (0 – 10 h), risk of rescue antiemetic (type of drug not given), side effects of acupressure. Patients recorded outcome measures on a questionnaire	
Notes	Adverse effects of acupressure wristbands: tightness, swollen hands, problems with infusion, itching wrists. Intraoperative nausea and vomiting reported Funding by a grant from the BC Medical Services Foundation. Wristbands were donated by Sea Band UK Ltd. No details of any declarations of interest among the authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"A table of random numbers was used to allocate patients to one of two groups"
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	"The nature of the bands was therefore unknown to the patient, anaesthetist and investigators for the duration of the study"
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"The nature of the bands was therefore unknown to the patient, anaesthetist and investigators for the duration of the study"
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"The nature of the bands was therefore unknown to the patient, anaesthetist and investigators for the duration of the study"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reasons for withdrawals were given. No missing data reported for the 244 participants analysed
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable. "Demographic analysis revealed no statistically significant difference between subjects in the two groups"
Dundee 1986		
Methods	Parallel-group randomized trial, conducted in Ireland. Study dates not reported	
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 (n = 25) 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 (n = 25) Group 3: no further treatment after premedication with nalbuphine 10 mg (n = 25)	
Outcomes	Nausea (0 – 6 h), vomiting (0 – 6 h), 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 No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.

Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	The authors took adequate steps to make interventions appear similar
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"Their assessments were performed by an observer who was unaware of which patients had undergone acupuncture"
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for 75 participants analysed.
Selective reporting (reporting bias)	Unclear risk	No details about the use of rescue antiemetic in anaesthetic protocol. The risk of rescue antiemetic drug not reported
Other bias	Low risk	"The groups were comparable in average age, weight, and duration of anaesthesia"
Dundee 1989		
Methods	Parallel-group randomized trial, conducted in Ireland. Study dates not reported	
Participants	155 women undergoing minor gynaecological surgery.	
Interventions	Acupuncture at P6 acupoint with 5 min manual stimulation after premedication (n = 31) Electroacupuncture at P6 acupoint for 5 min after premedication (n = 31) Antiemetic group 1 had cyclizine 50 mg IM after premedication (n = 31) Antiemetic group 2 had metoclopramide 10 mg IM after premedication (n = 31) Reference group had no treatment (n = 31).	
Outcomes	Nausea (0 – 6 h), vomiting (0 – 6 h), side effects of treatment	
Notes	For data analysis purposes, manual acupuncture and electro-acupuncture were combined. Reference group received no treatment and were not included in data analysis. This paper reported both controlled and uncontrolled studies of P6 stimulation. Used original data from secondary papers related to this study (Dundee 1989) (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 participants complained of drowsiness following antiemetic drug administration. For data analyses, manual acupuncture group was compared with cyclizine, and electroacupuncture group was compared with metoclopramide No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"Patients were visited at 1 h and 6 h after operation by a person who was unaware of the preoperative treatment"

Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for 155 participants analysed.
Selective reporting (reporting bias)	Unclear risk	No details about the use of rescue antiemetic in anaesthetic protocol. The risk of rescue antiemetic drug not reported
Other bias	Unclear risk	Demographic comparisons between groups were not given.
Ebrahim Soltani 2010		
Methods	Parallel 4-group randomized trial, conducted in Iran. Study conducted in Iran during 2007 to 2008	
Participants	200 participants aged 10 – 60 years old, with ASA physical status I to II, undergoing strabismus surgery. Exclusion criteria: nausea or vomiting within 1 week of surgery, local infection near acupoint, symptomatic comorbidities, travel sickness, length of stay in the recovery room more than 2 hours or those receiving any medical therapy before surgery	
Interventions	Group 1: sham acupressure wristbands place inappropriately on the posterior surface of both forearms 30 min before induction of anaesthesia plus saline 1ml IV. Removed wristband 6 hours after surgery (n = 50) Group 2: sham acupressure wristbands place inappropriately on the posterior surface of both forearms 30 min before induction of anaesthesia plus metoclopramide 0.2 mg/kg IV immediately before induction. Removed wristband 6 hours after surgery (n = 50) Group 3: sham acupressure wristbands place inappropriately on the posterior surface of both forearms 30 min before induction of anaesthesia plus ondansetron 0.15 mg/kg IV immediately before induction. Removed wristband 6 hours after surgery (n = 50) Group 4: bilateral wristbands on P6 acupoint 30 min before induction of anaesthesia plus saline 1ml IV. Removed wristband 6 hours after surgery (n = 50)	
Outcomes	Nausea (0 – 2 h), Vomiting (0 – 2 h) in recovery room	
Notes	Subgroup analysis for adults and children not done as overall population was mixed in age range (10 – 60 years). No incidence for postoperative nausea or vomiting (0 – 24 h) reported No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient details. "Patients were randomised into four groups using random numbers, with 50 cases in each group."
Allocation concealment (selection bias)	Unclear risk	Insufficient details.
Blinding of patients (performance bias) All outcomes	Low risk	Authors attempted to blind antiemetic drugs use with saline placebo and used sham acupressure wristbands on non-acupoint
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Wristbands were not covered with dressing. No details about whether healthcare providers were blinded or not
Blinding of outcome assessor (detection bias) All outcomes	Low risk	Nursing staff recording the PONV were unaware of group allocations
Incomplete outcome data (attrition bias) All outcomes	Low risk	"No patient was excluded after admission to the study."
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	"There was no statistically significant differences with respect to demographic data between groups in the study."
El-Deeb 2011		
Methods	Parallel 3-group randomized trial, conducted in Egypt. Study dates not reported	
Participants	450 women undergoing elective Caesaren delivery using spinal anaesthesia. Exclusion criteria: previous acupuncture treatment in the last 6 months, nausea or vomiting during 24 h preoperatively, diabetes, hypertension, cardiovascular disease, and any other major systemic comorbidities	

Interventions	Group 1: sham group (normal saline IV and sham electroacupuncture at dorsal side of forearm for 30 minutes) before spinal anaesthesia (n = 150) Group 2: ondansetron group (4 mg ondansetron IV 30 minutes and sham electroacupuncture at dorsal side of forearm for 30 minutes before spinal anaesthesia (n = 150) Group 3: electroacupuncture group (normal saline IV and electroacupuncture at P6 acupoint on both wrists for 30 minutes before spinal anaesthesia (n = 150)	
Outcomes	Postoperative nausea (0 – 6 h), postoperative vomiting (0 – 6 h), rescue antiemetic (ondansetron 4 mg IV, 0 – 6 h), treatment side effects	
Notes	"No local (cutaneous) side effects were reported at the acu-stimulation site by any patient in the treatment groups during the 24h study period. No complications were noted" No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient details given.
Allocation concealment (selection bias)	Unclear risk	Sealed envelop used. Comment: not sure if envelopes were sequentially numbered and opaque
Blinding of patients (performance bias) All outcomes	Low risk	Authors applied placebo drug and sham electroacupuncture techniques but blinding of participants not specified
Blinding of healthcare providers (performance bias) All outcomes	Low risk	Authors applied placebo drug and sham electroacupuncture techniques but blinding of healthcare providers not specified
Blinding of outcome assessor (detection bias) All outcomes	Low risk	Outcomes assessed by "independent anaesthetist who was blinded to group assignment"
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for 450 participants analysed.
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	"The three groups were not significantly different with respect to demographic characteristics, intraoperative ephedrine dose, gestational age, and duration of surgery"
Ertas 2015		
Methods	Parallel-group double-blinded randomized trial, conducted in Turkey. Study dates not reported	
Participants	62 adult women undergoing gynaecological laparoscopy under general anaesthesia. Exclusion: women who had nausea and vomiting within 24 h before surgery, use of antiemetics or glucocorticoids within 24 hours before surgery, users of pacemakers, pregnant or nursing women, obese women, diseases associated with nausea and vomiting, those switched from laparoscopic to laparotomy	
Interventions	Group 1: ReliefBand applied 15 – 30 min, at 31 Hz, on dominant hand before the operation and activated for 24 hours after surgery (n = 31) Group 2: Sham ReliefBand (electrodes wrapped in a plastic bandage and inactivated) applied 15 – 30 min, at 31 Hz, on dominant hand before the operation for 24 hours after surgery (n = 31)	
Outcomes	Risk of rescue antiemetic (IV metoclopramide 0.5 mg/kg) drug (0 – 24 h) and adverse effects of device. No incidence of postoperative nausea or vomiting reported in the first 24 h after surgery	
Notes	Severity of postoperative nausea and vomiting data not used. Authors stated that no adverse effects related to ReliefBand were observed. Power calculation done. Authors declared no financial or conflict of interest. Details about funding support not given	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**

Random sequence generation (selection bias)	Low risk	"Random numbers displayed on a list of codes prepared by a computerized system."
Allocation concealment (selection bias)	Low risk	"These codes were written on paper slips, which were placed in numbered opaque sealed envelopes."
Blinding of patients (performance bias) All outcomes	Low risk	"The patient and the research worker who held the records of the patient had no idea whether the ReliefBand was an authentic or a sham device."
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"The patient and the research worker who held the records of the patient had no idea whether the ReliefBand was an authentic or a sham device."
Incomplete outcome data (attrition bias) All outcomes	Low risk	All 62 women followed up.
Selective reporting (reporting bias)	High risk	Incidence of postoperative nausea and vomiting (0 – 24 h) not reported
Other bias	Low risk	Baseline characteristics (age, height, body weight, duration of anaesthesia, duration of surgery, Apfel risk scores, smoking history, history of PONV) were comparable between groups
Fassoulaki 1993		
Methods	Parallel-group randomized trial, conducted in Greece. Study dates not reported	
Participants	106 women undergoing abdominal hysterectomy. Exclusions: 3 women in the sham group were excluded because they were given metoclopramide in the postoperative period for persistent vomiting (but these data were 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 (n = 51) Sham group was treated the same way but with the electrical stimulator turned off (n = 52)	
Outcomes	Vomiting (0 – 2 h) without antiemetic rescue, risk of rescue antiemetic (metoclopramide)	
Notes	Potential bias if outcome assessor removed plastic bag covering the stimulator. Reported vomiting 2 – 4 h, 4 – 6 h, 6 – 8 h intervals. No data on vomiting (0 – 8 h) No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	"The stimulator, active or inactive, was covered with dark plastic bags, not allowing distinction between active and inactive stimulators"
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	Vomiting was assessed by "an independent observer who was unaware of the patient randomization and of TENS treatment"

Incomplete outcome data (attrition bias) All outcomes	High risk	"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
Selective reporting (reporting bias)	High risk	Nausea and side effects were not reported.
Other bias	Low risk	Baseline characteristics were comparable. "The two groups did not differ in age, body weight, duration of anaesthesia, and duration of surgery"
Ferrara-Love 1996		
Methods	Parallel-group randomized trial, conducted in United States. Study dates not reported	
Participants	136 adults undergoing orthopaedic, general, plastic, and 'other' surgery. Exclusions: 46 participants excluded after randomisation for failure to meet inclusion criteria	
Interventions	Group 1: acupressure wristbands placed on P6 acupoint during surgery until hospital discharge (n = 30) Group 2: sham acupressure wristbands without studs placed on P6 acupoint during surgery until hospital discharge (n = 30) Group 3: reference group had no acupressure treatment (n = 30)	
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 Study was funded by grants from the American Society of PostAnesthesia Nurses and SeaBand, United Kingdom No details about any declarations of interest among authors.	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	"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"
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar
Blinding of healthcare providers (performance bias) All outcomes	Low risk	PACU staff were blinded.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"Incidence of postoperative nausea and vomiting was documented by the PACU staff who were blinded as to treatment and placebo group"
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for the 90 participants analysed.
Selective reporting (reporting bias)	High risk	Risk of vomiting and side effects were not reported in the results
Other bias	Low risk	Baseline characteristics were comparable. "There were no differences between groups in demographic and perioperative variables" as tested using appropriate univariate statistical tests
Frey 2009a		
Methods	Parallel 4-arm randomized trial, conducted at a single German centre. Study dates not reported	
Participants	214 adult women undergoing vaginal hysterectomy requiring general anaesthesia. Exclusion: women with cardiac pacemaker or implanted defibrillator, at risk of malignant hyperthermia, had allergy to nickel/chrome, or change in surgical technique	

Interventions	Group 1: Acu-stimulation (ReliefBand) before induction of anaesthesia at P6 acupoint on dominant forearm for 24 h after surgery (n = 48) Group 2: Acu-stimulation (ReliefBand) after induction of anaesthesia at P6 acupoint on dominant forearm for 24 h after surgery (n = 53) Group 3: Sham acustimulation (inactivated ReliefBand electrodes with a silicone cover) before induction of anaesthesia at P6 acupoint on dominant forearm for 24 h after surgery (n = 49) Group 4: Sham acustimulation (inactivated ReliefBand electrodes with a silicone cover) after induction of anaesthesia at P6 acupoint on dominant forearm for 24 h after surgery (n = 50)	
Outcomes	Nausea (0 – 6 h), vomiting (0 – 6 h), rescue antiemetic (tropisetron 2 mg)	
Notes	Combined Groups 1 and 2 as acustimulation group, and Groups 3 and 4 as sham group for analysis. No cumulative incidence of 0 – 24 h outcomes reported No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient details.
Allocation concealment (selection bias)	Unclear risk	Participants randomized by "drawing a sealed envelope indicating treatment assignment." No details about envelopes being opaque
Blinding of patients (performance bias) All outcomes	Low risk	Authors made efforts to inactivate electrodes and place a silicone cover over the device which "was invisible for both patients and investigators."
Blinding of healthcare providers (performance bias) All outcomes	Low risk	Authors made efforts to inactivate electrodes and place a silicone cover over the device which "was invisible for both patients and investigators."
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"The investigators responsible for collecting data were blind to the treatments administered to the study patients."
Incomplete outcome data (attrition bias) All outcomes	Low risk	14 participants excluded after randomization due to change in surgical technique, resulting in final sample size of 200
Selective reporting (reporting bias)	High risk	Side effects of active and sham ReliefBand not assessed or reported
Other bias	Low risk	Groups were comparable for participant characteristics, duration of surgery and anaesthesia and risk score for PONV
Frey 2009b		
Methods	Parallel 4-arm randomized trial (single centre) conducted in Germany. Study dates not reported	
Participants	229 patients, aged more than 18 years with ASA physical status I to III, undergoing laparoscopic cholecystectomy. Exclusion criteria were patients with cardiac pacemaker or implanted cardioverter/defibrillator, at risk of malignant hyperthermia, with allergy to nickel/chrome or change in surgical technique	
Interventions	Group 1: Acustimulation (ReliefBand) before induction of anaesthesia at P6 acupoint on dominant forearm for 24 h after surgery (n = 59) Group 2: Acu-stimulation (ReliefBand) after induction of anaesthesia at P6 acupoint on dominant forearm for 24 h after surgery (n = 53) Group 3: Sham acustimulation (inactivated ReliefBand electrodes with a silicone cover) before induction of anaesthesia at P6 acupoint on dominant forearm for 24 h after surgery (n = 59) Group 4: Sham acustimulation (inactivated ReliefBand electrodes with a silicone cover) after induction of anaesthesia at P6 acupoint on dominant forearm for 24 h after surgery (n = 58)	
Outcomes	Nausea (0 – 2 h), vomiting (0 – 2 h), rescue antiemetic (tropisetron 2 mg), side effects of ReliefBand (skin irritation under electrodes)	
Notes	Combined Groups 1 and 2 as acustimulation group, and Groups 3 and 4 as sham group for analysis. No cumulative incidence of 0 – 24 h outcomes reported. No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**

Random sequence generation (selection bias)	Unclear risk	Insufficient details.
Allocation concealment (selection bias)	Unclear risk	Participants randomized by "drawing a sealed envelope indicating treatment assignment." No details about envelopes being opaque
Blinding of patients (performance bias) All outcomes	Low risk	Authors made efforts to inactivate electrodes and place a silicone cover over the device which "was invisible for both patients and investigators."
Blinding of healthcare providers (performance bias) All outcomes	Low risk	Authors made efforts to inactivate electrodes and place a silicone cover over the device which "was invisible for both patients and investigators."
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"Patients were evaluated for the occurrence of nausea, retching, vomiting, pain and potential side effects of ReliefBand (skin irritation under the electrodes) by an investigator unaware of the patients' group assignment."
Incomplete outcome data (attrition bias) All outcomes	Low risk	29 did not receive allocated intervention because of change of surgical technique. No missing data reported for the 200 participants analysed
Selective reporting (reporting bias)	Low risk	All expected outcomes reported. Authors stated "the requirement for rescue medication did not differ significantly between the treatment groups."
Other bias	Low risk	"The demographic and morphometric characteristics and factors likely to influence PONV were not significantly different in the acu-stimulation and sham groups as were intraoperative variables."
Gan 2004		
Methods	Parallel-group randomized trial, conducted in United States. Study dates not reported	
Participants	77 women 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 h of surgery. 2 women withdrew from study	
Interventions	Group 1: ondansetron 4 mg IV given at induction of anaesthesia and sham electro-acupoint stimulation at P6 acupoints (30 – 60 min before induction and continued to the end of surgery) (n = 25) Group 2: electro-acupoint stimulation at P6 bilaterally (30 – 60 min before induction and continued to the end of surgery) and saline IV given at induction of anaesthesia (n = 26) Group 3: sham electro-acupoint stimulation at P6 bilaterally (30 – 60 min before induction and continued to the end of surgery) and saline IV given at induction of anaesthesia (n = 24)	
Outcomes	Nausea (0 – 2 h), vomiting (0 – 2 h), risk of rescue antiemetic drug, adverse effects	
Notes	Rescue antiemetic was dexamethasone 8 mg IV when participant's nausea score > 5 out of 10 for 15 min or longer, 2 emetic episodes within 15 min, or at participant's request. No redness residue on acupoint site in any groups No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Randomization was achieved using a random number generator.."
Allocation concealment (selection bias)	Low risk	"…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
Blinding of patients (performance bias) All outcomes	Low risk	"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 x 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 (performance bias) All outcomes	Low risk	"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 x 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 (detection bias) All outcomes	Low risk	"Postoperative data were collected by a separate research nurse not involved in the preoperative or intraoperative management of patients"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reasons for withdrawals were given. No missing data reported for the 75 participants analysed
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable. "There was no difference in patient demographics among the groups"
Gieron 1993		
Methods	Parallel-group randomized trial, conducted in Germany. Study dates not reported	
Participants	90 women undergoing gynaecological operations (6 – 8 h).	
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 24 h (n = 30) Group 2: sham acupressure carried out by applying elastic bandage to P6 acupoint on the morning of the operation and left on for 24 h (n = 30) Group 3: no treatment (n = 30).	
Outcomes	Nausea (0 – 6 h), vomiting (0 – 6 h), risk of rescue antiemetic (metoclopramide)	
Notes	No treatment data were excluded from analysis. Also reported separate incidences of nausea and vomiting (0 – 1 h) and (6 – 24 h). No side effects identified in the trial No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	High risk	The outcome assessor was not blinded.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for 90 participants analysed.
Selective reporting (reporting bias)	Low risk	All expected outcomes were reported.
Other bias	Low risk	Baseline characteristics were comparable. "The anthropometric data, the duration of surgery and the amount of postoperative analgesia were comparable between the three groups"
Habib 2006		

Methods	Parallel-group randomized trial, conducted in United States. Study dates not reported	
Participants	94 women undergoing Caesarean delivery under spinal anaesthesia. Exclusion: previous experience of acupuncture or acustimulation, 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. 3 participants withdrew from study because of protocol violations	
Interventions	Transcutaneous acupoint electrical stimulation device on P6 acupoint of the dominant hand 30 – 60 min before surgery. Participants asked to wear wristband for 24 h after surgery (n = 47) Sham transcutaneous acupoint electrical stimulation device on dorsum of wrist of the dominant hand 30 – 60 min before surgery. Participants asked to wear wristband for 24 h after surgery (n = 44)	
Outcomes	Postoperative nausea (0 – 24 h), postoperative vomiting (0 – 24 h), 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 participant's request Study supported, in part, by departmental funds. No details about any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficent information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	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 (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"A separate researcher who was unaware of the patient's randomisation collected that data…"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reasons for withdrawals given. No missing data reported for 91 participants analysed
Selective reporting (reporting bias)	High risk	Side effects not reported
Other bias	Low risk	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"
Harmon 1999		
Methods	Parallel-group randomized trial, conducted in Ireland. Study dates not reported	
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 (n = 52) Sham acupressure on non-acupoint site, applied before induction for 20 min and removed before end of surgery (n = 52)	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), 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 participants did not have outcome data No details about funding source or any declarations of interest among authors	
Risk of bias		

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"Randomization was conducted by computer..".
Allocation concealment (selection bias)	Unclear risk	"…And the code was sealed until arrival of the patient in the operating theatre". Comment: not sure whether envelopes were sequentially numbered and opaque
Blinding of patients (performance bias) All outcomes	Low risk	"Both patients and nurses were unaware of patient group allocation"
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"Both patients and nurses were unaware of patient group allocation"
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"..An anaesthetist blinded to the therapy registered whether nausea, retching or vomiting had occurred"
Incomplete outcome data (attrition bias) All outcomes	High risk	In acupressure group (n = 52), missing nausea and vomiting data in 8 and 5 participants respectively. In sham group (n = 52), missing nausea and vomiting data in 13 and 5 participants respectively
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable. "The groups were comparable in age, weight and duration of surgical procedure"
Harmon 2000		
Methods	Parallel-group randomized trial, conducted in Ireland. Study dates not reported	
Participants	94 healthy women (18 – 40 years) undergoing elective Caesarean section. Exclusion: previous history of PONV, nausea and vomiting in previous 24 hours, obesity (BMI > 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 (n = 47) Sham acupressure on non-acupoint site, applied 5 min before administration of spinal anaesthesia, removed just before assessment 6 hours after discharge to the ward (n = 47)	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h).	
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" No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"Bands were not visible to the assessing anaesthetist during operations, as patients' arms were covered with surgical drapes"

Blinding of outcome assessor (detection bias) All outcomes	Low risk	"After 6 and 24h, an anaesthetist blinded to the therapy noted whether nausea, retching or vomiting had occurred"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reasons for withdrawals were given. No missing data reported for 94 participants analysed
Selective reporting (reporting bias)	High risk	Risk of rescue cyclizine not reported separately for nausea and vomiting outcomes
Other bias	Low risk	Baseline characteristics were comparable. "The groups were comparable with respect to age, weight, height and bupivacaine dose"
Ho 1990		
Methods	Parallel-group randomized trial, conducted in Taiwan. Study dates not reported	
Participants	100 women undergoing laparoscopy.	
Interventions	Group 1: electro-acupuncture applied at P6 acupoint on right wrist for 15 min in the recovery room (n = 25) Group 2: transcutaneous electrical nerve stimulation at P6 acupoint on right wrist for 15 min in the recovery room (n = 25) Group 3: antiemetic group was given prochlorperazine 5 mg IV (n = 25) Group 4: no treatment (n = 25).	
Outcomes	Vomiting (0 – 3 h), 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, except for subgroup analysis on technique. Side effect of electro-acupuncture were sleepiness and feeling tired No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Unclear risk	Insufficient information.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data were reported for the 100 participants analysed
Selective reporting (reporting bias)	High risk	Only vomiting was reported. Authors should have assessed nausea in women and the risk of rescue antiemetic drugs
Other bias	Low risk	Baseline characteristics were comparable. "The age, weight, and duration of anaesthesia did not differ significantly among the groups"
Ho 1996		
Methods	Parallel-group randomized trial, conducted in Taiwan. Study dates not reported	
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 (n = 30) 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 (n = 30)	
Outcomes	Nausea (0 – 48 h), vomiting (0 – 48 h), risk of rescue antiemetic drug, side effects of acupressure wristbands	
Notes	Rescue antiemetic was metoclopramide. No side effects were noted No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Randomization was conducted by computer..".
Allocation concealment (selection bias)	Unclear risk	"… 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
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"An independent anaesthesiologist blinded to the parturient groups followed up all parturients"
Incomplete outcome data (attrition bias) All outcomes	Low risk	"All parturients completed the trial and tolerated the bands well"
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	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"
Iqbal 2012		
Methods	Parallel-group randomized trial conducted in Pakistan from November 2011 to July 2012	
Participants	60 participants aged 40 – 60 years, ASA I and II, undergoing laparoscopic surgery. Exclusion: those with a history of severe adverse reactions to NSAIDs, bronchial asthma, kidney or liver dysfunction, bleeding disorders or history of steroids intake within 24 h of surgery	
Interventions	Group 1: acupressure wristband (Seaband) at the P6 acupoint to each wrist and draped with dressing during the stay in hospital. by an elastic bandage (n = 20) Group 2: sham acupressure (Seaband) on dorsal side of both forearms and draped with dressing during the stay in hospital (n = 20) Group 3: no treatment (n = 20).	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), risk of rescue antiemetic drug (metoclopramide 10 mg IV)	
Notes	No treatment data were excluded from analysis. No power calculation done No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**

Random sequence generation (selection bias)	Unclear risk	Insufficient details.
Allocation concealment (selection bias)	Unclear risk	Insufficient details.
Blinding of patients (performance bias) All outcomes	Low risk	Authors made efforts to drape dressing over active and sham wristbands
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"The doctors and nurses giving anesthesia and the nurses on the postoperative ward, although aware that stimulation was being performed were not aware of the location of PC6"
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"The doctors and nurses giving anesthesia and the nurses on the postoperative ward, although aware that stimulation was being performed were not aware of the location of PC6"
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data were reported for the 60 participants analysed
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Demographic data appear similar between acupressure and sham groups
Kim 2004		
Methods	Parallel-group randomized trial conducted in Korea.	
Participants	66 women, ASA physical status I or II, undergoing sevoflurane general anaesthesia for minor breast surgery. Exclusion criteria were women with respiratory, circulatory or neurological disease, liver or kidney dysfunction, nausea or vomiting in the 24 h before surgery, receiving antiemetics, pregnant women and excessively obesity	
Interventions	Group 1: Transcutaneous electrical stimulation (ReliefBand) on P6 acupoint 10 min before surgery and left in place for 24 h. Bilateral or unilateral simulation not reported (n = 33) Group 2: Sham transcutaneous electrical stimulation (inactivated ReliefBand) on P6 acupoint 10 min before surgery and left in place for 24 h. Bilateral or unilateral sham simulation not reported (n = 33)	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), risk of rescue antiemetic drug (ondansetron 4 mg IV)	
Notes	Descriptive data taken from information in Kim 2012.	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient details.
Allocation concealment (selection bias)	Unclear risk	Insufficient details.
Blinding of patients (performance bias) All outcomes	Low risk	Inactivated device that looks similar to the real device.
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient details.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	Unaware of allocated treatment at both baseline and postoperative evaluations
Incomplete outcome data (attrition bias) All outcomes	Low risk	No reported dropouts or withdrawals.

Selective reporting (reporting bias)	Low risk	All expected measured outcomes were reported.
Other bias	Low risk	Baseline characteristics were comparable.
Kim 2011		
Methods	Parallel-group randomized trial, conducted in Korea. Study dates not reported	
Participants	264 adult women, with ASA physical status I to II, undergoing laparoscopic hysterectomy. Exclusion criteria were women receiving antiemetics within 24 h of surgery, obesity, neuromuscular, hepatic, or renal diseases, or a history of allergic reactions to the medications used during anaesthesia	
Interventions	Group 1 (group control): 2 surface electrodes placed over ulnar nerve on dominant upper extremity before induction of anaesthesia and removed after anaesthesia in the operating room. Applied 1 Hz single twitch stimulation during anaesthesia maintenance (n = 54) Group 2 (group ST): 2 surface electrodes stimulated the median nerve at P6 acupoint on dominant upper extremity before induction of anaesthesia and removed after anaesthesia in the operating room. Applied 1 Hz single twitch stimulation during anaesthesia maintenance (n = 52) Group 3 (group TOF): 2 surface electrodes stimulated the median nerve at P6 acupoint on dominant upper extremity before induction of anaesthesia and removed after anaesthesia in the operating room. Applied TOF stimulation every 15 seconds during anaesthesia maintenance (n = 53) Group 4 (group DBS): 2 surface electrodes stimulated the median nerve at P6 acupoint on dominant upper extremity before induction of anaesthesia and removed after anaesthesia in the operating room. Applied double-burst stimulation every 20 seconds during anaesthesia maintenance (n = 53) Group 5 (group tetanus): 2 surface electrodes stimulated the median nerve at P6 acupoint on dominant upper extremity before induction of anaesthesia and removed after anaesthesia in the operating room. Applied tetanus stimulation at 50 Hz for 5 seconds every 10 min during anaesthesia maintenance (n = 52)	
Outcomes	Nausea (0 – 6 h), Vomiting (0 – 6 h), rescue antiemetic (ondansetron 4 mg IV), side effects	
Notes	Group 1 considered as sham. Groups 2 – 5 combined as 1 acustimulation group. “No side-effects were reported from the electrical stimulation.” Participants in the acustimulation group were more likely to be highly satisfied with PONV management (VAS 7 – 10) at 24 h than sham group (91% versus 75%, P = 0.003) Authors declare no conflicts of interest. No details about funding support for study	
Risk of bias		
Bias	**Authors’ judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient details given.
Allocation concealment (selection bias)	Unclear risk	Insufficient details given.
Blinding of patients (performance bias) All outcomes	Low risk	“The patients, as well as the anesthesiologist and the nursing staff, were unaware of the patient grouping.”
Blinding of healthcare providers (performance bias) All outcomes	Low risk	“The patients, as well as the anesthesiologist and the nursing staff, were unaware of the patient grouping.”
Blinding of outcome assessor (detection bias) All outcomes	Low risk	Independent outcome assessor “was unaware of the patient randomization and of the neuromuscular monitoring mode.”
Incomplete outcome data (attrition bias) All outcomes	Low risk	No dropouts for 264 participants recruited into study.
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	“Baseline characteristics of study participants were similar, as were intraoperative variables.”
Klein 2004		
Methods	Parallel-group randomized trial, conducted in Canada. Study dates not reported	
Participants	152 people undergoing coronary artery bypass graft or valvular surgery.	

	Exclusion: past history of hiatus hernia, heartburn, or previous gastric surgery, morbid obesity, taking antiemetic medications, H_2 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 (n = 75) 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 (n = 77)	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), risk of rescue antiemetic drug, risk of adverse effects	
Notes	Rescue antiemetic was dimenhydrinate 50 mg IV for participants who reported moderate or severe nausea, or who experienced retching or vomiting. No significant adverse effects reported in either group No details about any declarations of interest among authors. Acupressure bands were provided by Sea Band, United Kingdom	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Patients were randomized by computer-generated random number tables to either acupressure or placebo control groups"
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"The anaesthesiologist caring for the patient was not aware of group allocation"
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"All patients were assessed for nausea and vomiting by nursing staff in the intensive care unit, who were unaware of treatment allocation"
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for the 152 participants analysed.
Selective reporting (reporting bias)	Low risk	Reported all expected outcomes.
Other bias	Low risk	Baseline characteristics were comparable. "There were no differences between the 2 groups with regard to demographic data and surgical characteristics"
Koo 2013		
Methods	Parallel-group randomized trial that compared capsicum plaster stimulation of P6, K-D2 and sham acupoints. Study conducted in Korea	
Participants	184 adults, aged 21 – 64 years, undergoing thyroid surgery between November 2012 and March 2013. Exclusion: obese, gastro-oesophageal reflux, use of antiemetic, histamine H_2-receptor antagonist or tranquillizer within 72 hours before surgery, or respiratory disease	
Interventions	Group 1: Sham P6 and K-D2 inactive tape, similar in appearance to capsicum plaster, applied to both wrists at P6 acupoint and both deltoid 30 min before induction of anaesthesia and left on for 8 h (n = 46) Group 2: Capsicum plaster applied to both wrists at P6 acupoints and inactive tape applied at both deltoids 30 min before induction of anaesthesia and left on for 8 h (n = 46) Group 3: Capsium plaster applied to both K-D2 points on index finger of hand and inactive tape applied at both deltoids 30 min before induction of anaesthesia and left on for 8 h (n = 46) Group 4: Capsium plaster applied to both deltoids and inactive tape applied to both wrists at P6 acupoint 30 min before induction of anaesthesia and left on for 8 h (n = 46)	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), rescue antiemetic (metoclopramide 10 mg IV)	
Notes	Groups 3 and 4 were not included in the analysis. Power calculation done. No details about financial support or conflict of interests of authors reported in article	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**

Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	"After enrolment, patients were randomized to four groups by sealed envelope." Comment: no details about use of sequential numbering or opaque envelopes
Blinding of patients (performance bias) All outcomes	Low risk	"The patients and the investigators as well as anesthesiologists and nurses, were unaware of the patient grouping."
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"The patients and the investigators as well as anesthesiologists and nurses, were unaware of the patient grouping."
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"The patients and the investigators as well as anesthesiologists and nurses, were unaware of the patient grouping."
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants followed-up to 24 h after surgery. "There were no dropouts among the 184 enrolled subjects."
Selective reporting (reporting bias)	High risk	Adverse effects of capsicum plaster not reported.
Other bias	Low risk	"The patients' characteristics, such as sex, age, weight, height, duration of anesthesia, history of PONV, history of motion sickness, nonsmoking status and intraoperative remifentanil use, were comparable between groups."
Lewis 1991		
Methods	Parallel-group randomized trial, conducted in United States. Study dates not reported	
Participants	66 children undergoing strabismus correction surgery. Excluded: children with anatomical or neurological abnormalities of the upper limbs. 2 children lost to follow-up	
Interventions	Group 1: acupressure wristbands placed on P6 acupoints 1 h before surgery and worn until discharge from hospital (n = 33) Group 2: sham acupressure wristbands without studs placed on P6 acupoints 1 h before surgery and worn until discharge from hospital (n = 33)	
Outcomes	Vomiting (0 – 24 h), 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 No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar
Blinding of healthcare providers (performance bias) All outcomes	Low risk	The anaesthetic staff were blinded.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"A second blinded investigator recorded all other perioperative data, including the incidence of postoperative nausea and vomiting in the recovery areas"

Incomplete outcome data (attrition bias) All outcomes	Low risk	Two participants in acupressure group had incomplete data. Comment: unlikely to have a clinically relevant impact on summary estimate
Selective reporting (reporting bias)	High risk	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
Other bias	Low risk	Baseline characteristics were comparable. "There were no significant differences between the two groups in their patient characteristics"
Liu 2008		
Methods	Parallel-group randomized trial, conducted in China. Study conducted from June 2006 to July 2007	
Participants	96 people undergoing laparoscopic cholecystectomy who were aged 18 – 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 participants withdrew from study	
Interventions	Group 1: transcutaneous electro-acupoint stimulation using a peripheral nerve stimulator at P6 (2 – 100 Hz, 50 ms, 0.5 – 4 mA) applied 30 to 60 min before induction of anaesthesia, and continued to the end of surgery (n = 48) Group 2: inactive device with similar electrode for transcutaneous electro-acupoint stimulation using a peripheral nerve stimulator at P6 applied 30 – 60 min before induction of anaesthesia, and continued to the end of surgery (n = 48)	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), risk of rescue antiemetic drug (0 – 24 h), adverse effects of transcutaneous electro-acupoint stimulation	
Notes	Rescue antiemetic drug was ondansetron 4 mg IV, to participants who had a nausea score of > 5 on a 10-point scale, vomited twice within 15 min, or at the participant'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 2 groups No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Patients were randomized into two groups of 48 in each using a table of random numbers"
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"The anesthesiologists and care providers were blinded to the study group"
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"Postoperative data were collected by a separate research nurse who was not aware of the preoperative or perioperative management of patients"
Incomplete outcome data (attrition bias) All outcomes	Low risk	"All 96 patients completed the study".
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable. "As shown in Tables 1 and 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"
Majholm 2011		
Methods	Parallel-group randomized trial, conducted in Denmark. Study conducted from May 2005 to December 2006	

Participants	134 healthy non-smoking women undergoing breast surgery given total intravenous anaesthesia. Exclusions: pregnancy, women graded ASA physical status at least III, smoked or had comorbidities that could influence sensitivity in wrists and hands, skin problems at the location of wristband or had experienced nausea or vomiting within 24 h of surgery. Of the 134 participants, 22 withdrew, leaving 112 completing the study	
Interventions	Group 1: acupressure wristbands (Vital-Band) placed on P6 acupoints just before induction and worn until 24 h after surgery, covered with dressing (n = 67) Group 2: sham acupressure wristbands with studs placed on dorsum of the forearm just before induction surgery and worn until 24 h after surgery, covered with dressing (n = 67)	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), risk of rescue antiemetic drug (0 – 24 h), adverse effects associated with wristband	
Notes	P6 wristband adverse effects: 19/57 (redness), 7/58 (tenderness), 3/59 (paraesthesia), 8/59 (swelling). Sham wristband adverse effects: 20/53 (redness), 9/53 (tenderness), 1/53 (paraesthesia), 9/52 (swelling). Similar risk of adverse effects between groups for redness (P = 0.59), tenderness (P = 0.59), paraesthesia (P = 0.62) and swelling (P = 0.61) Manufacturer of Vital-Band paid USD 9000 for testing of their device No details about any declarations of interest among authors.	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Random allocation sequence was generated by drawing one of these sealed envelopes" and "In order to avoid staff members to figure out the randomization outcome of the last envelopes, we had more sealed randomization envelopes than needed according to the sample size calculation"
Allocation concealment (selection bias)	Low risk	"Randomized using opaque sealed envelopes".
Blinding of patients (performance bias) All outcomes	Low risk	"The wristband was covered with a dressing in such a way that both the patient and the outcome assessors were blinded and unable to discover in which position the acupressure wristband had been applied"
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	No details available.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"The wristband was covered with a dressing in such a way that both the patient and the outcome assessors were blinded and unable to discover in which position the acupressure wristband had been applied"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reasons for 22 lost to follow-up and discontinued intervention were given
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable for preoperative factors (except history of PONV or motion sickness, or both), intraoperative factors and morphine use in the postoperative period
Misra 2005		
Methods	Parallel-group randomized trial, conducted in India. Study dates not reported	
Participants	123 adults (18 – 52 y) undergoing middle ear surgery. Exclusion: pregnancy, obesity, diabetes mellitus, impaired renal or liver functions; people who had taken H_2 antagonists, antiemetics, or psychoactive medication; or had nausea, retching, or vomiting within 48 h before surgery. 3 participants withdrew because: they required administration of dexamethasone (n = 2), and facial nerve injury (n = 1)	
Interventions	Group 1: sham plaster 1 cm × 1 cm 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 (n = 40) Group 2: capsicum plaster containing capsicum oleoresin 1% w/w 1 cm × 1 cm 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 (n = 38) Group 3: sham plaster 1 cm × 1 cm 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 (n = 39)	

Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), risk of rescue antiemetic drug (0 – 24 h), adverse effects of plaster	
Notes	Nausea (0 – 6 h), vomiting (0 – 6 h), incidence of rescue antiemetic (0 – 6 h) also reported. Rescue antiemetic was ondansetron 4 mg IV for participants with persistent nausea for more than 5 min, 2 or more episodes of vomiting/ retching, or at participant'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" No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"The subjects were randomly assigned to one of the three groups using a computer-generated random number table"
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"Anesthesia was standardized and given by an anesthesiologist blinded to group assignment"
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"The incidence of PONV was evaluated within six hours and 24 hr after transfer to the postoperative unit by a blinded observer"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reasons for withdrawals given. No missing data reported for the 120 participants analysed
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable. "The demographic characteristics of the three groups were similar, as were history of previous PONV and motion sickness"
Nilsson 2015		
Methods	Parallel-group randomized trial, conducted in Sweden.	
Participants	120 adults undergoing elective infratentorial or supratentorial craniotomy from November 2011 to June 2013. Exclusion: mental impairment or communication problems and use of antiemetics within 12 h before surgery	
Interventions	Group 1: SeaBand acupressure wristband with plastic button was applied on wrist P6 acupoint (marked by neurosurgical ward nursing staff) on wrist that did not have an intra-arterial catheter at the end of surgery by a nurse anaesthetist (n = 52). Duration of acupressure wristband application was 48 h Group 2: Sham SeaBand acupressure wristband without plastic button was applied on wrist P6 acupoint (marked by neurosurgical ward nursing staff) on wrist that did not have an intra-arterial catheter at the end of surgery by a nurse anaesthetist (n = 60). Duration of sham acupressure wristband application was 48 h Prophylactic IV ondansetron 4 mg was given at the end of surgery to both groups	
Outcomes	Nausea (0 – 48 h), vomiting (0 – 48 h), rescue antiemetic (0 – 48 h), adverse effects related to wristbands	
Notes	Authors reported median times, not incidence, that rescue antiemetic (IV ondansetron 1 – 4 mg or droperidol 0.625 – 1.25 mg, or both) were used (0 – 48 h) for each group. No significant difference in proportion of participants requiring antiemetics between groups Power calculation done. The side effects (swelling, bruises, paraesthesia or pain) were equally distributed between P6 acupressure group (n = 7) and sham group (n = 7). Study was supported by the hospitals research foundation. Active and sham wristbands were partly provided by the manufacturer. Authors declared no conflicts of interests	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Patients were "randomly assigned to either the PC6 acupressure group or the sham group using a computer-generated random number table."

Allocation concealment (selection bias)	Low risk	Sealed envelopes, prepared by persons not involved in study, contained information about wristband placement and presumably group allocation
Blinding of patients (performance bias) All outcomes	Low risk	"Both the PC6 acupressure bands and the sham bands were covered with a bandage to ensure blinding to the patient and outcome assessor."
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"Both the PC6 acupressure bands and the sham bands were covered with a bandage to ensure blinding to the patient and outcome assessor."
Incomplete outcome data (attrition bias) All outcomes	Low risk	120 randomized but 95 in final analysis (43 in PC6 acupressure group and 52 in sham group). Reasons for withdrawals were described. "There was no difference between the groups in excluded patients (P = 0.406)."
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	"The 2 groups were comparable with respect to medical and demographic characteristics, anesthesia, surgical techniques, risk factors for PONV, and postoperatively administered opioids."
Ravi 2010		
Methods	Parallel-group randomized trial, conducted in India. Study dates not reported	
Participants	50 people aged 4 – 60 years with ASA physical status I or II undergoing surgery (general, laparoscopic, ENT, paediatric, orthopaedic, obstetric, gynaecological) under general anaesthesia. Exclusion criteria: people with cardiovascular disease, central nervous system problems, previous history of PONV and motion sickness, and smokers	
Interventions	Group 1: P6 acupoint injection with 50% 0.2 ml dextrose after induction of anaesthesia (n = 25) Group 2: Ondansetron (50 μg/kg) at end of surgery (n = 25).	
Outcomes	Nausea (0 – 6 h), vomiting (0 – 6 h), rescue antiemetic (ondansetron 4 mg)	
Notes	Subgroup analysis for adults and children not done as overall population was mixed in age range (4 – 60 years) No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated random numbers table.
Allocation concealment (selection bias)	Unclear risk	Insufficient details given.
Blinding of patients (performance bias) All outcomes	Low risk	"Both patients and doctors were unaware of the group allocation."
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"Both patients and doctors were unaware of the group allocation."
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"An anaesthetist blinded for the study assessed the presence of nausea and vomiting."
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for the 50 participants analysed.
Selective reporting (reporting bias)	High risk	Incidence of rescue ondansetron 4 mg for intolerable PONV in recovery room and postoperative ward not reported

Other bias	Low risk	Age, sex ratio, weight of participants and duration of surgery were similar between groups
Rusy 2002		
Methods	Parallel-group randomized trial, conducted in United States. Study dates not reported	
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. 1 child disqualified after enrolment when propofol was administered during the anaesthetic	
Interventions	**1** Electro-acupuncture at P6 for 20 min after child was awake (n = 40) **2** Sham electro-acupuncture at P2 for 20 min after child was awake (n = 40) **3** Sham reference group had no needles inserted. Insulated wires were attached to insides of arm and stimulation box was activated to maintain blinding (n = 40)	
Outcomes	Vomiting (0 – 24 h), nausea (0 – 24 h), risk of rescue antiemetic drugs	
Notes	Rescue antiemetics were ondansetron and droperidol IV. Sham electro-acupuncture and sham reference group data were combined for analysis Funding source was the Jane B Pettit Pain Foundation, Children's Hospital of Wisconsin. No details about any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"A randomized block design procedure was used to assign enrollees to one of three groups.."
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"Experienced recovery room nurses, who were blinded to the treatment group, assessed nausea and vomiting"
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"Experienced recovery room nurses, who were blinded to the treatment group, assessed nausea and vomiting"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reason for withdrawal of one participants was given. No missing data reported for 120 participants analysed
Selective reporting (reporting bias)	Unclear risk	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"
Other bias	Low risk	Baseline characteristics were comparable. "The groups were similar for age, sex, weight, analgesics administered, and surgical time (table 1), with no differences found"
Sadighha 2008		
Methods	Parallel-group randomized trial, conducted in Iran. Study dates not reported	
Participants	156 adults undergoing elective laparoscopic cholecystectomy with ASA physical status I to II. Excluded: those with a history of PONV, kidney dysfunction, BMI > 35 kg/m^2, use of antiemetics or H_2 receptor antagonists within 72 hours of surgery, history of gastrointestinal disease, intra-abdominal pressure > 15 mm Hg, or surgery duration of more than 2 h	
Interventions	Group 1: acupressure wristband at a P6 acupoint before induction until recovery discharge (n = 51) Group 2: metoclopramide 0.2 mg/kg IV at end of surgery and sham acupressure wristband at a non-acupoint before induction until recovery discharge (n = 53)	

	Group 3: no antiemetic and had sham acupressure wristband at a non-acupoint before induction until recovery discharge (n = 52)	
Outcomes	Nausea (recovery), vomiting (no time point specified).	
Notes	Power calculation done. Funding source was Shaheed Beheshti University of Medical science. No details about any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	"Patients were randomly assigned to treatment groups according to the last digit of the medical record number."
Allocation concealment (selection bias)	High risk	"Patients were randomly assigned to treatment groups according to the last digit of the medical record number."
Blinding of patients (performance bias) All outcomes	Low risk	Authors used sham acupressure and participants given general anaesthesia would not be aware of any antiemetic drugs given at end of surgery
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient details given.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"Assessors of nausea and vomiting were blinded to the treatment."
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for 156 participants analysed.
Selective reporting (reporting bias)	High risk	No treatment side effects or rescue antiemetic use reported.
Other bias	Low risk	"Demographic and clinical characteristics of the three groups were similar."
Samad 2003		
Methods	Parallel-group randomized trial, conducted in Pakistan. Study dates not reported	
Participants	50 people (18 – 60 y) undergoing laparoscopic cholecystectomy. Exclusion: obesity (weight > 80 kg), diabetics, people with history of PONV, people receiving antiemetics and histamine H_2 antagonists	
Interventions	Acupressure band on right hand at P6 acupoint ½ h before induction of anaesthesia, and kept on for 6 hours after surgery (n = 25) Sham acupressure band on right hand with plastic bead placed on the dorsum of forearm (n = 25)	
Outcomes	Nausea (0 – 6 h), vomiting (0 – 6 h), 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 No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Patients were randomly assigned by random table number to either group.."
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar

Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"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…"
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for 50 participants analysed.
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable. "There was no statistically significant difference with respect to age, sex, weight and duration of surgery between the two groups"
Schlager 1998		
Methods	Parallel-group randomized trial, conducted in Austria. Study dates not reported	
Participants	40 children (3 – 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 min before induction of anaesthesia and 15 min after arriving in the recovery room (n = 20) Sham laser stimulation held on P6 acupoints but laser beam not activated, 15 min before induction of anaesthesia and 15 min after arriving in the recovery room (n = 20)	
Outcomes	Vomiting (0 – 24 h), 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 – 2 h, 0 – 6 h) also recorded in the paper Funding source was from Helbo-Medizintechnik GmbH and the Ludwig Boltzmann Institute for Acupuncture. No details about any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	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 (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Unclear risk	Insufficient information.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for 40 children analysed.
Selective reporting (reporting bias)	Unclear risk	Risk of nausea was not recorded because it may be difficult to assess in children. Authors stated that "stimulation of PC6 with a low-level laser has no known side effects"
Other bias	Low risk	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)"
Schultz 2003		
Methods	Parallel-group randomized trial, conducted in United States. Study conducted from July 1999 to August 2000	
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 h 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 h after surgery) (n = 30) 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 h after surgery). Sham acupressure wristband had flat button which did not exert pressure on P6 acupoint (n = 24) Group 3: normal saline IV at induction and acupressure wristband at P6 acupoint on both wrists before surgery (worn up to 48 h after surgery) (n = 24) Group 4: normal saline IV at induction and sham acupressure wristband at P6 acupoint on both wrists before surgery (worn up to 48 h after surgery) (n = 25)	
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. Sea Bands were provided by manufacturer. No details about any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Used random-number table.
Allocation concealment (selection bias)	Low risk	"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…"
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Unclear risk	Insufficient information.
Incomplete outcome data (attrition bias) All outcomes	High risk	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
Selective reporting (reporting bias)	High risk	Risk of side effects and use of rescue antiemetic drugs were not described in the paper
Other bias	Low risk	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
Sharma 2007		
Methods	Parallel-group randomized trial, conducted in India. Study dates not reported	
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 (n = 20) Group 2: bilateral P6 acupuncture 5 min before induction of anaesthesia. Intermittent stimulation was given at P6 acupoints by rotating needle clockwise and anticlockwise up to 30 min (n = 20) Group 3: combination of group 1 and group 2 interventions (n = 20)	
Outcomes	Nausea (0 – 7 h), vomiting (0 – 7 h), risk of rescue antiemetic drug (0 – 7 h), risk of adverse effects	
Notes	Rescue antiemetic was metoclopramide 10 mg IV. No pain, bleeding, vasovagal attack, or broken acupuncture needles noted in any of the groups No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	High risk	"Blinding of any form was not possible because acupuncture needles had to be kept in situ in the operating room"
Blinding of healthcare providers (performance bias) All outcomes	High risk	"Blinding of any form was not possible because acupuncture needles had to be kept in situ in the operating room"
Blinding of outcome assessor (detection bias) All outcomes	High risk	"Blinding of any form was not possible because acupuncture needles had to be kept in situ in the operating room"
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for 60 women analysed.
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	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…"
Shenkman 1999		
Methods	Parallel-group randomized trial, conducted in United States. Study dates not reported	
Participants	100 children (2 – 12 y) undergoing tonsillectomy. Exclusion: congenital heart disease or significant pulmonary disease, predisposition for emesis or actual emesis in the 24 h before surgery, use of medications with antiemetic effects within the 24 h before surgery, infection over an acupuncture point, need for postoperative intubation for more than 1 h, 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 (n = 47) 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 (n = 53)	
Outcomes	Vomiting (0 – 24 h), risk of rescue antiemetic drug, side effects of acupressure/acupuncture	
Notes	Rescue antiemetic was ondansetron IV if 2 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 Funding source from National Institutes of Health General Clinical Research Centre (grant number MRR 02172). Acubands provided by Lifestyle Enterprises, New Jersey. Intradermal needles supplied by OMS Medical Supplies, Massachusetts. No details about any declarations of interest among authors	
Risk of bias		

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar. P6 acupoints and sham points on all patients were covered with opaque adhesive tape
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"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 (detection bias) All outcomes	Low risk	"Postanesthesia care unit and ward nurses who assessed and charted postoperative emesis and medication administration were blinded to the group assignment of each patient"
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for 100 participants analysed.
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable. "There were no differences between the groups with regard to demographics or previous retching, vomiting, or either (table 2)"
Streitberger 2004		
Methods	Parallel-group randomized trial, conducted in Germany. Study was conducted between January and August 2002	
Participants	212 women 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. 1 woman in the acupuncture group withdrew consent and was treated as a failure in the analysis	
Interventions	Acupuncture group: 52 participants had acupuncture to P6 acupoint on both wrists, 20 min before induction of anaesthesia; another 54 participants had acupuncture to P6 acupoint on both wrists immediately after induction of anaesthesia Sham acupuncture: 51 participants had placebo acupuncture to P6 acupoint on both wrists, 20 min before induction of anaesthesia; another 55 participants had placebo acupuncture to P6 acupoint on both wrists immediately after induction of anaesthesia	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), risk of rescue antiemetic drugs, adverse events related to acupuncture	
Notes	Dimenhydinate and dolasetron rescue antiemetics used. Haematomas reported by 1 participant in the acupuncture group and by 2 participants in the placebo acupuncture group. Allergy to sticky plaster reported by 5 participants in each group. No severe adverse reaction reported Funding source from University of Heidelberg (grant number F.203583). No details about any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	"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 (selection bias)	Low risk	"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"
Blinding of patients (performance bias) All outcomes	Low risk	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 (performance bias) All outcomes	Low risk	"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 (detection bias) All outcomes	Low risk	"The patients, the observer of the endpoints, the nurses, the anaesthetists and all other staff members were not informed about the allocation"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reasons for withdrawals given. Intention-to-treat analysis used
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Baseline characteristics were comparable. "Baseline characteristics revealed no relevant differences between the two groups (table 1)"
Tavlan 1996		
Methods	Parallel-group randomized trial, conducted in Turkey. Study dates not reported. This study was reported as an abstract	
Participants	65 women (18 – 45 y) undergoing gynaecological laparoscopy.	
Interventions	Group 1: ondansetron 8 mg IV before induction (n = 25). Group 2: 0.2 ml 50% dextrose on the P6 acupoint before induction (n = 20) Group 3: 20 ml IV saline before induction.	
Outcomes	Nausea (0 – 1 h), vomiting (0 – 1 h).	
Notes	Group 3 (n = 20) not used in the acupoint P6 stimulation versus sham analyses No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Unclear risk	Insufficient information.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data reported for 65 participants analysed.
Selective reporting (reporting bias)	Unclear risk	Risk of side effects and rescue antiemetic drugs not given because the article was an abstract
Other bias	Low risk	Baseline characteristics were comparable. "No significant differences were observed between the groups in terms of demography"
Turgut 2007		
Methods	Parallel-group randomized trial, conducted in Turkey. Study dates not reported	

Participants	102 women aged 40 – 65 years, with no previous experience of acupressure bands, undergoing elective gynaecological surgery (total abdominal hysterectomy and bilateral salpingo-oophorectomy). 1 participant in acupressure group and 1 in sham group withdrew because of swelling and erythema in treated hand and protocol violation respectively. Exclusion criteria: obesity (BMI > 30), diabetes, history of motion sickness, PONV, or smoking	
Interventions	Acupressure group: wristband with plastic bead positioned at P6 point on both wrists, 30 min before induction of general anaesthesia. Wristbands left on for 24 h (n = 51) Sham group: wristband with plastic bead positioned at non-acupoint site on the dorsal surface of both forearms, 30 min before induction of general anaesthesia. Wristbands left on for 24 h (n = 51) Both groups were educated on the use of participant-controlled analgesia before surgery. Participants received participant-controlled analgesia containing morphine in the postanaesthetic care room, and continued for 24 h	
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 1 participant in the acupressure group who withdrew due to swelling and erythema of the treated hand. Rescue antiemetic was metoclopramide 10 mg IV No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	Authors took adequate steps to make interventions appear similar
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"The anaesthesiologists caring for the patients were not aware of group assignment"
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"The study was observer-blinded".
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reasons for withdrawal given. No missing data reported for 100 participants analysed
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	"Patients of both groups were comparable with regard to age, weight, height, ASA physical status and duration of surgery"
Wang 2002		
Methods	Parallel-group randomized trial, conducted in United States. Study dates not reported	
Participants	190 children (7 – 16 y) undergoing general anaesthesia and outpatient surgical procedures. Exclusions: ASA physical status higher than II and people with a history of developmental delay or prematurity. 3 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 1 mL tuberculin syringe with a 25-gauge needle at a depth of 5 to 7 mm from skin (n = 50) Group 2: after induction, droperidol 10 ug/kg IV was given. Superficial skin prick at the P6 acupoint was performed before end of surgery (n = 49) 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 (n = 43) Group 4: after induction, intravenous saline was given. Superficial skin prick at the P6 acupoint was performed before end of surgery (n = 45)	
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. Groups 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 – 24 h) according to author Funding source from Foundation of Anesthesia Education and Research, Society of Pediatric Anesthesia and National Institutes of Health (NICHD R01HD37007-01). No details about any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Yoking randomization (based on computer-generated list) was used for equal distribution of variables that are known to affect the outcome
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	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 (performance bias) All outcomes	Low risk	"Children, parents, surgeons, anesthesiologists, PACU nursing staff, and the research assistant, were all blinded to group assignment"
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"Children, parents, surgeons, anesthesiologists, PACU nursing staff, and the research assistant, were all blinded to group assignment"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Details about withdrawals were given. No missing data reported for 187 children analysed
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	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"
Wang 2010		
Methods	Parallel-group randomized trial, conducted in China. Study dates not reported	
Participants	80 people, aged 20 – 60 years, undergoing supratentorial craniotomy. Excluded people were obese (BMI > 30), diabetic, had a history of motion sickness or recent PONV or smoked	
Interventions	Group 1: transcutaneous electrical acupoint stimulation at right wrist P6 acupoints 30 min before induction of anaesthesia, left on for 6 hours after surgery (n = 40) Group 2: sham transcutaneous electrical acupoint stimulation at non-acupoint on dorsal side of the forearm 30 min before induction of anaesthesia, left on for 6 hours after surgery (n = 40) Ondansetron 4 mg IV given as routine antiemetic treatment for each participant before skin closure in both groups	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), rescue antiemetic (metoclopramide 10 mg IV), side effects	
Notes	Authors reported that no adverse effects or complications occurred associated with treatment groups No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated random number table.
Allocation concealment (selection bias)	Unclear risk	Insufficient details given.
Blinding of patients (performance bias) All outcomes	Low risk	"None of the patients had experience with acupuncture electrodes." Patients were also "unaware whether the sensation was coming from an acupoint or a non-acupoint."

Blinding of healthcare providers (performance bias) All outcomes	Low risk	Attending anaesthetist was blinded to treatment allocation. "The screen on the unit was covered with an opaque tape in both groups, so that clinicians and observers were unaware whether the unit was at an acupoint or not."
Blinding of outcome assessor (detection bias) All outcomes	Low risk	Trained nurse staff did the PONV and were blind to the position of the electrode
Incomplete outcome data (attrition bias) All outcomes	Low risk	80 participants were randomized and all completed the study.
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Demographic and perioperative characteristics in Table 1 were comparable between groups
White 2002		
Methods	Parallel-group randomized trial, conducted in United States. Study dates not reported	
Participants	120 adults undergoing elective plastic surgery. Excluded: antiemetic medication within 24 h before surgery, pregnancy, using permanent cardiac pacemaker, previous experience with acustimulation treatment, experiencing vomiting or retching within 24 h before surgery. No participants withdrew before discharge from hospital, 5 participants withdrew from study at 72 hours follow-up	
Interventions	Group 1: ondansetron 4 mg and inactive acustimulation device (ReliefBand) at P6 acupoint on arrival in the recovery room. Device worn for 72 hours after surgery (n = 40) Group 2: saline 2 mL and active acustimulation device (ReliefBand) at P6 acupoint on arrival in the recovery room. Device worn for 72 hours after surgery (n = 40) Group 3: ondansetron 4 mg and active acu-stimulation device (ReliefBand) at P6 acupoint on arrival in the recovery room. Device worn for 72 hours after surgery (n = 40)	
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 min. No swelling at wrist or erythema reported. No outcome measures (0 – 72 h) given in the paper Funding source from department. First author received past funding from both Woodside Biomedical systems and GlaxoSmith-Kline	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"Patients were randomly assigned to one of three treatment groups using a computer-generated random number table…"
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	All participants were told that the Relief-Band acu-stimulation device produces a sensation which they may or may not feel to minimize bias. Participants recorded outcome measures in a participant diary
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Low risk	All participants were told that the Relief-Band acustimulation device produces a sensation which they may or may not feel to minimize bias. Participants recorded outcome measures in a participant diary
Incomplete outcome data (attrition bias) All outcomes	Low risk	1 participant lost to follow-up in ondansetron group, 1 lost to follow-up in acu-stimulation group, and 3 lost to follow-up in combination group. Author used intention to treat analysis
Selective reporting (reporting bias)	Low risk	All expected outcomes were reported.

Other bias	Low risk	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"
White 2012		
Methods	Parallel-group randomized trial, conducted in United States. Study dates not reported	
Participants	100 adult outpatients, with ASA physical status I – II, undergoing major laparoscopic surgery. Exclusion criteria were people receiving antiemetic drugs within 24 hour before surgery, previous experience using acustimulation device for management of pain or emetic symptoms, history of alcohol or drug abuse within last 3 months, or a skin lesion or irritation at P6 acupoints	
Interventions	Group 1: Bilaterial acupressure (Pressure Right) strips on P6 acupoints 30 – 60 min before entering operating room and left in place for 72 h after surgery. Dexamethasone 4 mg IV given before start of surgery, ondansetron 4 mg IV given at end of surgery (n = 50) Group 2: Sham acupressure (no plastic button) strips on P6 acupoints 30 – 60 min before entering operating room and left in place for 72 hours after surgery. Dexamethasone 4 mg IV given before start of surgery, ondansetron 4 mg IV given at end of surgery (n = 50)	
Outcomes	Nausea (0 – 72 h), vomiting (0 – 72 h), rescue antiemetic (metoclopramide 10 mg IV and prochlorperazine 25 mg suppository), side effects of acupressure	
Notes	Outcomes 0 – 24 h also reported. Participants in the acupressure group were more likely to be highly satisfied with PONV management at 72 h than sham group (mean difference 18%, 95% CI 1% to 34%). No difference in 48 h or 72 h quality of recovery score between groups. "Incidence of side-effects did not differ between the two study groups (Table 4)." Power calculation done Active and sham Pressure Right acupressure devices were provided by manufacturer. Authors declare no conflicts of interest	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated randomisation scheme.
Allocation concealment (selection bias)	Unclear risk	Insufficient details given.
Blinding of patients (performance bias) All outcomes	Low risk	Strips were identical.
Blinding of healthcare providers (performance bias) All outcomes	Low risk	Placement of acupressure or sham acupressure strips by co-investigator not involved in outcome assessment
Blinding of outcome assessor (detection bias) All outcomes	Low risk	Blinded observer questioned each participant before discharge and via telephone interviews about outcomes
Incomplete outcome data (attrition bias) All outcomes	Low risk	100 participants completed the study and all participants completed the follow-up evaluations
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Demographic characteristics and history of PONV or motion sickness were not significantly different in the 2 antiemetic study groups
Xu 2012		
Methods	Parallel-group randomized trial, conducted in China. Study dates not reported	
Participants	130 adults, ASA physical status I – III, undergoing infratentorial craniotomy. Excluded: those with previous experiences with acupuncture, nausea or vomiting within 24 h before surgery, preoperative use of antiemetics (except dexamethasone), cardiac pacemaker, cardioverter, or defibrillator, pregnant or breastfeeding at time of surgery, obese (BMI > 35), mental retardation or psychiatric illness	

Interventions	Group 1: transcutaneous electrical acupoint stimulation at dominant wrist P6 acupoints 30 min before induction of anaesthesia, left on for 24 hours after surgery (n = 65) Group 2: sham transcutaneous electrical acupoint stimulation at dominant wrist P6 acupoints 30 min before induction of anaesthesia but no electrical stimulation activated, left on for 24 h after surgery (n = 65) Ondansetron 4 mg IV and dexamethasone 10 mg given as routine antiemetic treatment for each participant during surgery in both groups	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), rescue antiemetic (metoclopramide 10 mg IM)	
Notes	Power calculation done. Authors reported that no adverse effects (cutaneous irritation, bleeding, nerve injury) occurred associated with treatment groups. Authors have no conflicts of interest. Study supported by grants from Major State Basic Research Development Program of China (973 Program No. 2007CB12502) and National Natural Science Foundation of China (No. 81171235/H0914)	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated random number table.
Allocation concealment (selection bias)	Low risk	Sequentially-numbered, opaque sealed envelopes.
Blinding of patients (performance bias) All outcomes	Low risk	"Display screens of the units were concealed from view for patients and other investigators… All patients were told that a tingling or numbing sensation might or might not be felt, regardless of the the group assignment."
Blinding of healthcare providers (performance bias) All outcomes	Low risk	"Display screens of the units were concealed from view for patients and other investigators."
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"Trained nursing staff, who were blinded to the group assignments, assessed PONV…"
Incomplete outcome data (attrition bias) All outcomes	Low risk	11 (8%) participants withdrew, probably due to those who could not be extubated within 2 h after surgery or had impaired consciousness in the neurological intensive care unit
Selective reporting (reporting bias)	Low risk	All expected outcomes were reported.
Other bias	Low risk	"No differences in patient demographics, risk factors for PONV, duration of anaesthesia, intraoperative opioids and postoperative analgesic consumption between the two groups."
Yang 1993		
Methods	Parallel-group randomized trial, conducted in Taiwan. Study dates not reported	
Participants	120 women undergoing gynaecological laparoscopy.	
Interventions	Group 1: acupuncture group included participants given an injection of 0.2 mL 50% glucose in water into P6 acupoint before extubation (n = 40) Group 2: antiemetic group was droperidol 20 ug/kg IV on induction of anaesthesia (n = 40) Group 3: no treatment (n = 40).	
Outcomes	Vomiting (0 – 3 h), side effects of acupuncture.	
Notes	Reference group received no treatment and was not included in data analysis. Pain at acupoint site noted No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.

Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of healthcare providers (performance bias) All outcomes	Unclear risk	Insufficient information.
Blinding of outcome assessor (detection bias) All outcomes	Unclear risk	Insufficient information.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data recorded for 120 participants analysed.
Selective reporting (reporting bias)	High risk	Nausea was not reported.
Other bias	Low risk	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”
Yentis 1992		
Methods	Parallel-group randomized trial, conducted in Canada. Study dates not reported	
Participants	90 children (1 – 16 y) undergoing strabismus surgery. 1 child in each of the 3 groups could not be contacted after surgery	
Interventions	Group 1: acupuncture at P6 acupoint on right wrist with 5 min of manual stimulation after induction of anaesthesia (n = 30) Group 2: antiemetic group had 0.075 mg/kg droperidol IV after induction of anaesthesia (n = 30) Group 3: acupuncture (as in Group 1) and droperidol (as in Group 2) treatment (n = 30)	
Outcomes	Vomiting (0 – 48 h), 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 No details about funding source or any declarations of interest among authors	
Risk of bias		
Bias	**Authors’ judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Insufficient information.
Allocation concealment (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	“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 (performance bias) All outcomes	Low risk	“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 (detection bias) All outcomes	Unclear risk	Insufficient information.
Incomplete outcome data (attrition bias) All outcomes	Low risk	One participant in each group lost to follow-up. Comment: unlikely to bias summary estimate.

Selective reporting (reporting bias)	High risk	Need for rescue antiemetic not reported in Results. Nausea was not reported because it may have been difficult to assess in younger children
Other bias	Low risk	Baseline characteristics were comparable. "Age, weight, number of muscles repaired and duration of anaesthesia did not differ among the groups"
Zhu 2010		
Methods	Parallel-group randomized trial, conducted in China. Study dates not reported	
Participants	120 women undergoing gynaecological laparoscopic surgery, ASA I – II, for general anaesthesia	
Interventions	Group 1: dilute droperidol injected into bilateral P6 acupoints using an acupuncture needle at 20 min before surgery. Twisted needle at depth of 2.5 cm to 3 cm to get needling sensation, and retained for 10 min (n = 40) Group 2: 2.5 mg droperidol IV 20 minutes before surgery (n = 40) Group 3: no treatment.	
Outcomes	Nausea (0 – 24 h), vomiting (0 – 24 h), side effects of droperidol	
Notes	No treatment data were excluded from analysis. No drowsiness, anxiety or extrapyramidal reactions observed in any groups No details about any declarations of interest among authors.	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Participants were randomized into 3 groups using a random-numbers table
Allocation concealment (selection bias)	Unclear risk	Sequential but no other details given.
Blinding of patients (performance bias) All outcomes	High risk	Participants unlikely to be blinded as they were conscious in order to feel needling sensation of acupuncture
Blinding of healthcare providers (performance bias) All outcomes	High risk	No attempt to mask sham acupuncture in droperidol group.
Blinding of outcome assessor (detection bias) All outcomes	Unclear risk	Insufficient details given.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data recorded for 120 participants analysed.
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	Age and type of surgery among groups were comparable.
Zárate 2001		
Methods	Parallel-group randomized trial, conducted at 4 university centres in United States. Study dates not reported	
Participants	250 adults undergoing laparoscopic cholecystectomy. Excluded: people 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 h before surgery. 29 adults were excluded because of protocol violations	
Interventions	Group 1: ReliefBand (watch-like acustimulation device) positioned at P6 acupoint before the end of surgery. The device was set to deliver a 25 mA stimulus at 31 Hz. Participants wore the device for 9 hours after surgery (n = 110) Group 2: ReliefBand with no acustimulation positioned at P6 acupoint before end of surgery, worn up to 9 hours after surgery (n = 56) Group 3: ReliefBand with no acustimulation positioned at the dorsal aspect of the wrist before end of surgery, worn up to 9 hours after surgery (n = 55)	
Outcomes	Nausea (0 - arrival in recovery room), vomiting (0 - arrival in recovery room), risk of rescue antiemetic (0 – 2 h), 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 participants 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 Study supported by grants from Woodside Biomedical Inc and the White Mountain Institute. The second and third authors are paid consultants for Woodside Biomedical Inc

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"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 (selection bias)	Unclear risk	Insufficient information.
Blinding of patients (performance bias) All outcomes	Low risk	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 (performance bias) All outcomes	Low risk	"The recovery room nursing staff were unaware of the acu-stimulation treatment group to which the patient had been assigned"
Blinding of outcome assessor (detection bias) All outcomes	Low risk	"The recovery room nursing staff were unaware of the acu-stimulation treatment group to which the patient had been assigned"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reasons for withdrawals were given. No missing data recorded for 221 participants analysed
Selective reporting (reporting bias)	Low risk	All expected outcomes reported.
Other bias	Low risk	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"

ASA = American Society of Anesthesiologists

BMI = body mass index

cm = centimetres

DBS = double burst stimulation

ENT = Ear, nose, throat

h = hour

Hz = Hertz

H2 = selective histamine type 2 receptor

IM = intramuscular

IV = intravenous

K-D2 = Korean hand acupuncture K-D2 point

Kg = kilograms

mA = milliamperes

mg = milligrams

ml = millilitres

mm = millimetres

n = number of participants

NSAIDs = nonsteroidal anti-inflammatory drugs

P6 = pericardium acupoint

PACU = postoperative anaesthesia care unit

PC = pericardium acupoint

PONV = postoperative nausea and vomiting

ST = single twitch

TENS = transcutaneous electrical nerve stimulation

TOF = train-of-four

VAS = visual analogue scale

y = years

Table 3

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

Study	Reason for exclusion
Agarwal 2005	PC6 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 PC6 acupoint
Alkaissi 2005	Participants did not undergo surgery.
Cekmen 2007	PC6 acupoint stimulation not used. Authors used transcutaneous electrical nerve stimulation on neck and mastoid area
Chen 2005	No sham treatment group used.
Coloma 2002	Treatment of established postoperative nausea and vomiting.
Dundee 1988	Incidences of nausea and vomiting were not reported separately
Dundee 1991	2 different forms of PC6 stimulation (acupuncture + saline, acupuncture + 1% lidocaine). No sham treatment group used
El-Bandrawy 2013	Severity of nausea and vomiting symptoms assessed, not incidence
El-Rakshy 2009	Multiple acupoints used.
Fan 1997	Incidences of nausea and vomiting were not reported separately
Fry 1986	No sham treatment group used. Control was defined as no acupressure treatment. Participants did not know that they were in the trial
Grube 2009	Multiple acupoints used (Hegu, Quchi, Neiguan, Zusanli, Neiting, Sanyinjiao, Daichong)
Hirs 2013	Ambiguous details about group allocation following results of unpublished pilot study
Ho 2006	Prevention of intraoperative nausea and vomiting, not postoperative outcomes
Jin 2013	No sham PC6 acupoint stimulation group.
Kabalak 2005	Both Pericardium and Shangwan acupoints used. No treatment was given to the control group
Khan 2004	Incidences 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
Kim 2010	Control group appears to be no-treatment. Unable to get full text
Klaiman 2008	Incidences of nausea and vomiting were not reported separately
Korinenko 2009	Multiple acupoints used.
Larson 2010	Severity of nausea and vomiting symptoms assessed, not incidence
Lee 2008	No sham treatment group used.
Lee 2013	No sham treatment group used.
Liodden 2011	Control group was standard care without acupuncture/acupressure
Lu 2013	No sham treatment group used.
McConaghy 1996	Treatment of established postoperative nausea and vomiting.
McMillan 1994	All transcutaneous electrical stimulation at PC6 acupoint groups received antiemetics. Incidences of nausea and vomiting were not reported separately for placebo transcutaneous electrical stimulation and transcutaneous electrical stimulation groups
Ming 2002	Multiple acupoints used.
Ng 2011	Incidences of nausea and vomiting were not reported separately
Norheim 2010	Control group was standard care without acupuncture/acupressure
Noroozinia 2013	Prevention of intraoperative nausea and vomiting, as well as postoperative nausea and vomiting. Unclear how long acupressure wristband was applied on for. Metoclopramide given for intraoperative nausea and vomiting will affect subsequent PONV incidence comparisons

Study	Reason for exclusion
Ouyang 2009	No sham treatment group used. Control was defined as no acupuncture at PC6 acupoint before and during anaesthesia
Phillips 1994	No sham treatment group used. No specific details of the type of antiemetic drug used as control
Schwager 1996	Both PC6 and Li4 acupoints stimulated.
Shyr 1990	Control was defined as no acupuncture at PC6 acupoint.
Sinha 2011	Nausea and vomiting during labour and delivery, not postoperative outcomes
Somri 2001	Multiple acupoints used.
Stein 1997	Prevention of intraoperative nausea and vomiting.
Tang 2013	No sham treatment group used.
Wang 2014	Multiple acupoints used.
Weightman 1987	No sham treatment group used. Control was defined as no acupuncture at PC6 acupoint after induction of anaesthesia
White 2005	This study compared 3 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	Retrospective chart review was used to estimate the incidence of vomiting. Incidences of nausea and vomiting were not considered separately, and results were not presented in the paper
Yeh 2010	Multiple acupoints used for pain and PONV.
Yentis 1991	No sham treatment group used. Control was no acupuncture treatment at PC6 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
Zheng 2008	Multiple acupoints used.

IV - intravenous

K-D2 = Korean hand acupuncture K-D2 point

PC = pericardium acupoint

PONV = postoperative nausea and vomiting

Table 4

Estimated NNTB for preventing PONV (PC6 acupoint stimulation versus sham)

Control event rate	Nausea	95% CI	Vomiting	95% CI
10%	31	25 to 43	25	20 to 34
20%	16	13 to 22	13	10 to 17
30%	10	8 to 14	8	7 to 11
40%	8	6 to 11	6	5 to 9
50%	6	5 to 9	5	4 to 7
60%	5	4 to 7	4	3 to 6
70%	4	4 to 6	4	3 to 5
80%	4	3 to 5	3	3 to 4
90%	3	3 to 5	3	2 to 4

CI = confidence interval

NNTB = number needed to treat for an additional beneficial outcome

PC6 = pericardium acupoint

PONV = postoperative nausea and vomiting